Railway
Engineering and Maintenance

RAILWAY ENGINEERING AND MAINTENANCE
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Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

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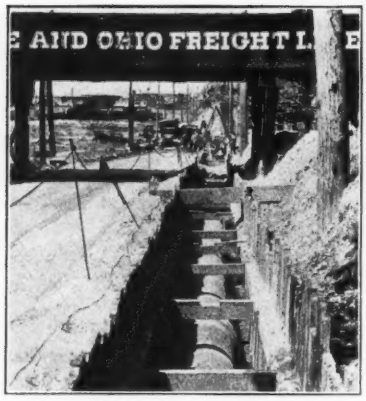
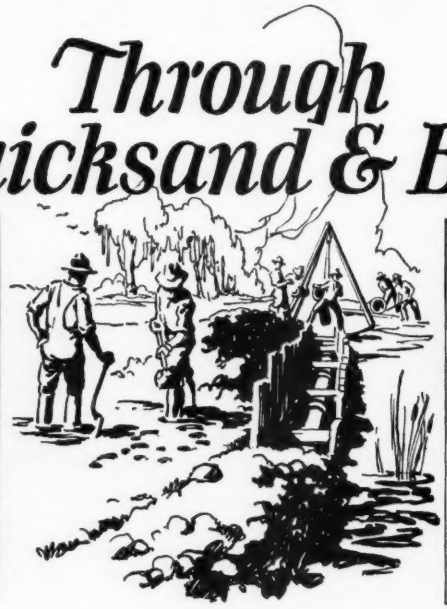
Through Quicksand & Bog





PIPE line construction often encounters soils that make the work both difficult and expensive.

It is one thing to run a line through good stiff soil and quite another to lay it in quicksand, bog or running sand.

Under bad conditions, the speed with which Bell and Spigot Cast Iron Pipe can be laid and the joints calked simplifies construction and represents a material saving in first cost.

Such a case is shown at the left, in which a 30-inch line is being laid in running sand requiring tight sheeting. Other jobs on which Cast Iron Pipe simplified difficult construction are shown at the right and below.

Soils of this character make maintenance work equally expensive. There again Cast Iron Pipe reduces costs as its use cuts down the necessity for repairs. It is seldom, if ever, necessary to take up for repairs, gas or water mains of Cast Iron Pipe.

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THE BELL & SPIGOT JOINT

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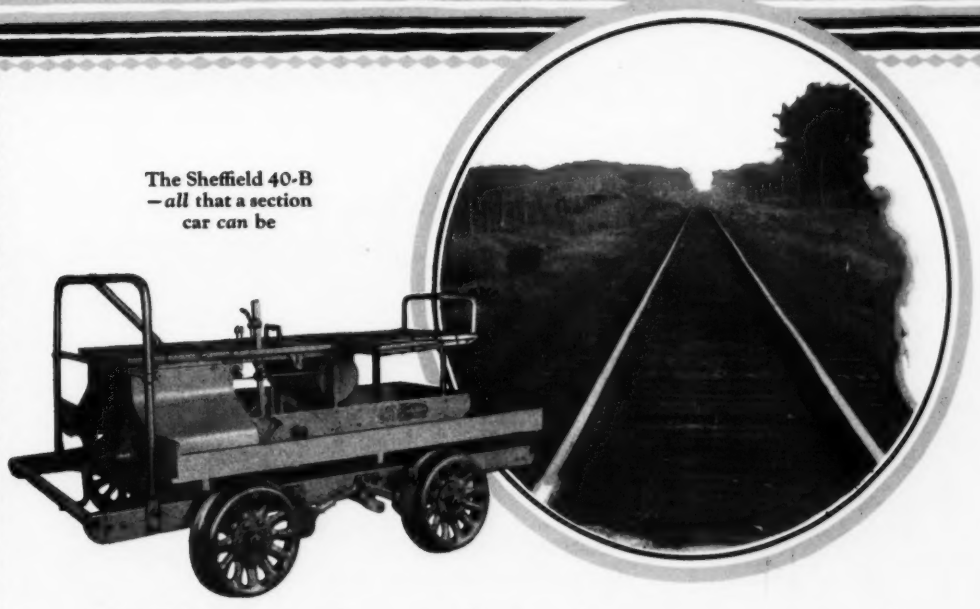
Send for booklet, "Cast Iron Pipe for Industrial Service," showing interesting installations to meet special problems



The Sheffield 40-B
—*all* that a section
car can be

What the old-timers see in F-M Section Cars

Men who for many years have been close to the development of railway motor cars see something in F-M cars that is even more significant to them than the more outstanding features that have been pioneered by Fairbanks-Morse.

This "something" is the perfection of details—a perfection that could only have been slowly and surely worked out during thirty years of intimate contact with practical railway requirements.

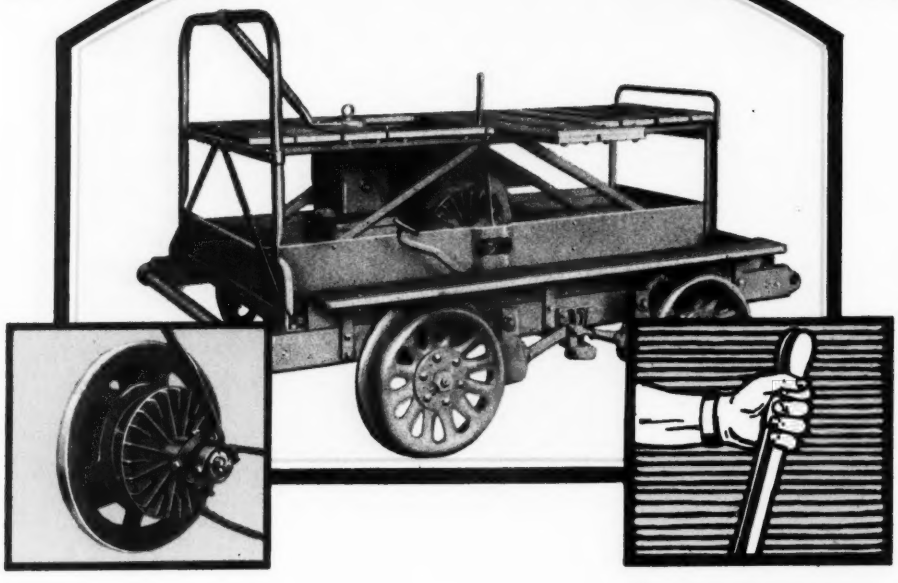
To men who know section cars the perfection of F-M cars is only comparable to the swift transition of the automobile from its first crude form to its present trouble-free, always-ready-to-go state.

Fairbanks-Morse motor cars, like the modern automobile, are the finished product of perfected manufacturing process and all that is best in automotive engineering!

Typical Fairbanks-Morse refinements are described on the next page

FAIRBANKS-MORSE
MOTOR CARS

First on the rails — and still first



Engineering? . . . or brawn?

To build section motor cars that can be compared to the modern automobile it has been necessary to avoid any features that lack in positiveness and ease of operation.

Thus the belt drive and the old brute-force method of tugging at a tension lever have given way to chain drive and positive clutch control in the Sheffield 44—one-cylinder water-cooled car.

Here is a clutch that is an engineering masterpiece—a clutch that is velvety in action, but positive when fully engaged. Slip it as much as you want. The cooling fins which dissipate the heat, and the other finely worked out details of design, make it equal to the roughest treatment.

This clutch-controlled chain drive eliminates the sliding engine base and the troubles that go with it. It permits locating the driving sprocket close to the flywheel so that there is little stress on the crankshaft. Moreover, the stress on the crankshaft in a chain-driven car is a *known* stress that does not vary—a stress that can be definitely provided for in construction.

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Remember, the "44" is simply one of the many Fairbanks-Morse Cars that have been blazing the trail of motor car development for more than thirty years.

Each a leader in its class

Sheffield 40-B Everything a two-cylinder air-cooled car should be. Abundant power. High torque at low speeds. Finely built throughout.

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MOTOR CARS

First on the rails —and still first

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Application of air dumping to standard railroad cars has been made practical by this Principle.

Companies requiring large capacity dump car equipment will find no substitute for the Principle and should make proper engineering examination before purchasing.

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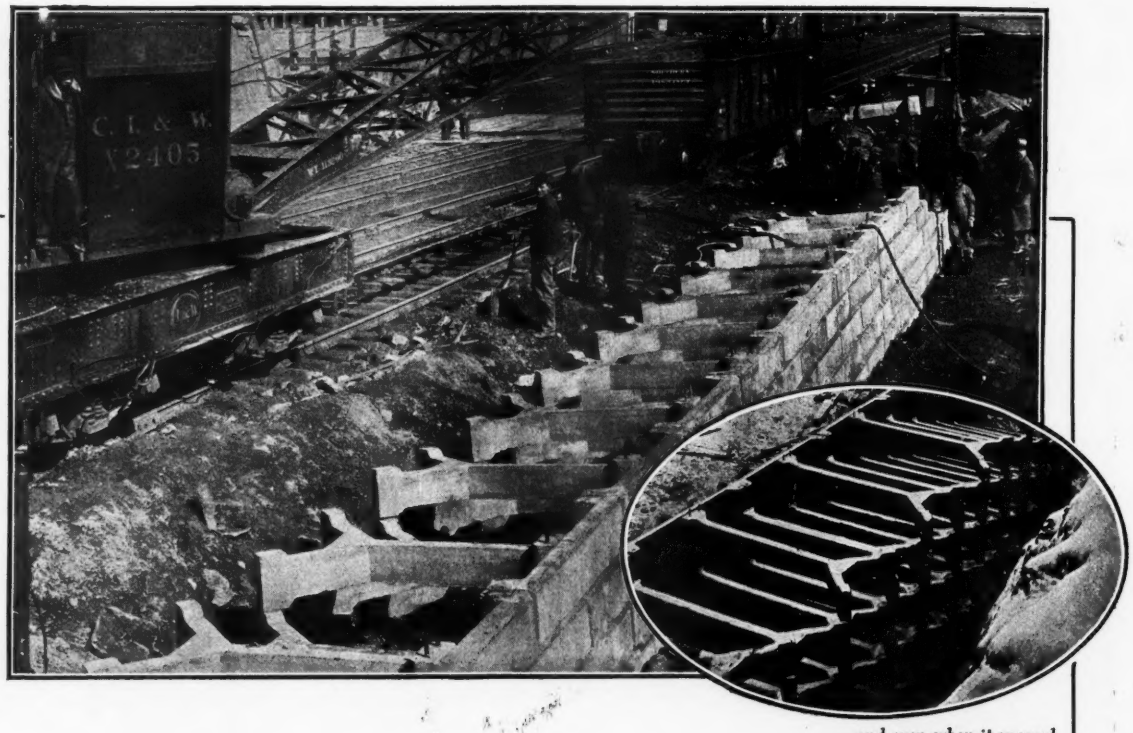
CLARK CARS
EXTENSION SIDE DUMP



. . . and even when it snowed the work went right ahead

As Simple as it Look!

FEDERAL Concrete Cribbing has only two basic units: a front stretcher and a header. They form a wall that can be quickly installed, and that is designed to withstand permanently the severest conditions of service. Practically 100 per cent salvage is obtained should it be found necessary to move the wall to another location.

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FEDERAL CEMENT TILE COMPANY
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Pneumatic Tie Tampers

Reduce Track Work Costs

They tamp more track with less labor and in less time. Four men with these tools will tamp more track in one day and do a better job than sixteen men with picks or bars. Actual records show pneumatic tampers make a smoother, safer and more permanent roadbed which lasts on the average of two to three times as long as hand tamped track.

Pneumatic Tamping Outfits are a quick means for reducing costs of track work. The tamper compressor is a handy portable power plant which can be used to operate a variety of labor aiding track tools at other times when not used for tamping.

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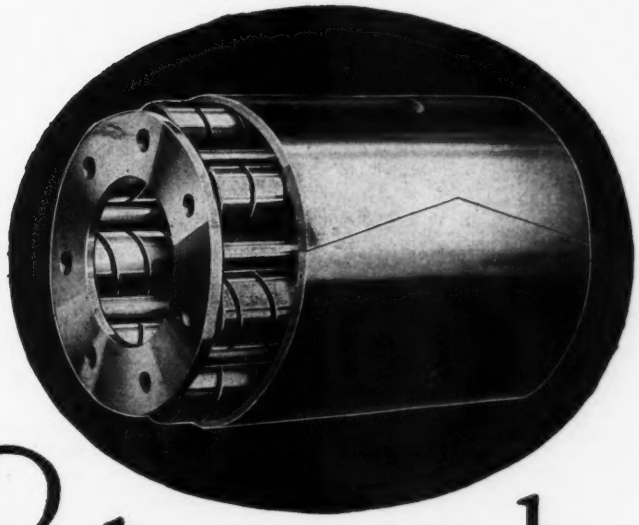

8 hours a day of *work—not tinkering*

Give your men maintenance equipment that eliminates track-side tinkering—that lets them devote all their time to profit-producing work.

Hyatt Roller bearings on maintenance cars give continuous, lasting service.

In their grit-proof housing, the helically wound Hyatt Bearings practically eliminate friction and wear; insure correct alignment; reduce lubrication to once in every three or four months.

Railways in every part of the world are saving time and money with Hyatt-ized maintenance cars.

30% on gasoline
50% on friction resistance
80% on lubrication

Leading builders of maintenance cars in the United States and Canada standardize on Hyatt Roller Bearings and furnish replacement boxes to fit present equipment.

Hyatt Roller Bearings insure dependable maintenance work. Specify them.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago San Francisco
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ROLLER BEARINGS

Quality Ties in Quantity

Ready For Shipment Now

THE rigid enforcement of A. R. E. A. Specifications gives ***International*** ties the distinction of superiority. No more exacting enforcement of specifications is known in the tie industry than that practiced at ***International*** plants.

You can depend on every shipment of ***International*** ties to meet specifications exactly. That means full size ties, sound timber, accurate grading, thorough seasoning and proper treatment. A large stock of these ties, all groups, all grades, is at present available for immediate or deferred shipment.

Order yours now while they last

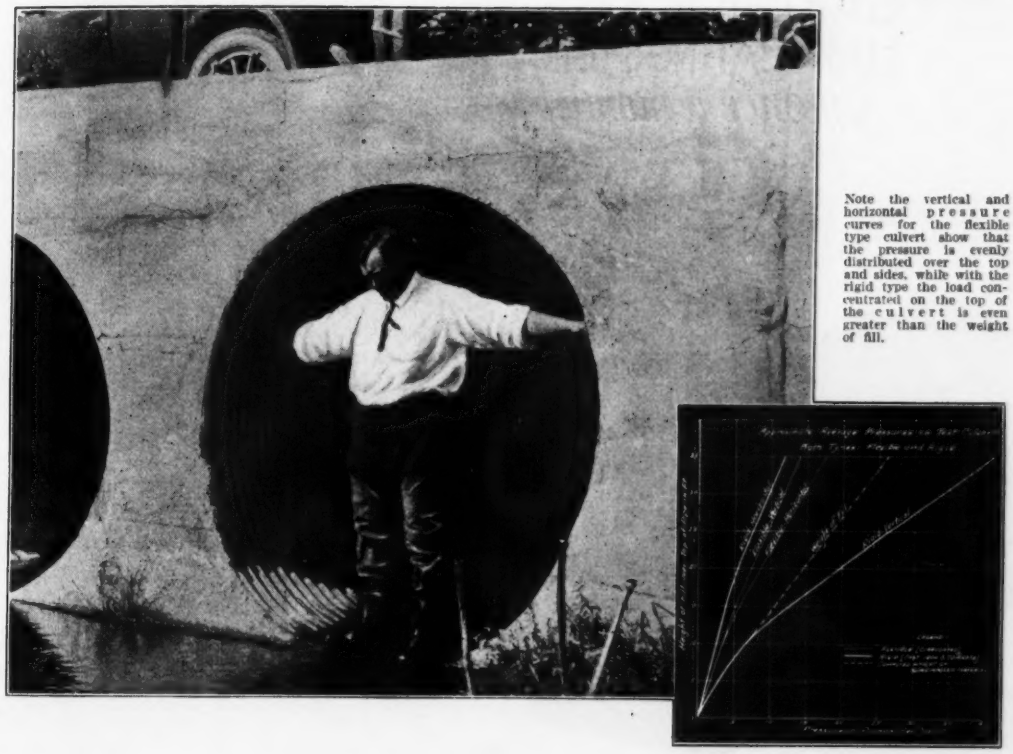
International Creosoting & Construction Co.

General Office—Galveston, Texas

International

STANDARD SPECIFICATION TIES

Another ARMCO Achievement!



Note the vertical and horizontal pressure curves for the flexible type culvert show that the pressure is evenly distributed over the top and sides, while with the rigid type the load concentrated on the top of the culvert is even greater than the weight of fill.

Large Diameter Culverts
Safe! Efficient! Economical!

ARMCO Culverts now offer an easy, better way to bridge small streams. In sizes from 60 to 108 inch diameters the same economies are obtained that have made the smaller size ARMCO Culvert the preferred drainage structure, namely—

1. Low cost of handling and placing.
2. Speed and simplicity of installation.
3. Freedom from repairs.
4. Ample strength—no breakage.
5. Great durability—low cost per year of service.

Large diameter Armco culverts provide great drainage capacity at so low a cost that there need be no contraction of the roadway. No foundations or abutments, no bridge floor repairs, no painting, no maintenance expense.

Heavy gauge metal, exclusive with Armco, gives added security in the severest service, when needed. From the A. R. E. A. test at Farina, Illinois, has come authoritative proof of the soundness of Armco design.

The service of Armco engineers for assistance in design and installation — is yours for the asking.

ARMCO Ingot Iron

ARMCO CULVERT & FLUME MANUFACTURERS' ASSN.
Middletown, Ohio

ARMCO CULVERTS

Consistent performance—because of consistent uniformity

This photograph of one of the cranes used by Gr. Northern crews was taken during preliminary tests made late in the winter.

RE-LAYING MORE THAN A MILE A DAY

Great Northern Crews making good records with Parsons Rail Cranes and 54-man gangs.

REPORTS from the Great Northern on the performance of Parsons Rail Cranes will be interesting to railroad men who want to speed up their re-laying work this year.

There are many outstanding features of the Parsons Rail Crane, which contribute to its effectiveness. One of them is the method of counter-weighting.

The counter-weight rails are supported on sliding I-beams, which may be adjusted to receive a sufficient number of rails to keep the crane in perfect balance while in traction and swinging a 3000-pound load through wide angles. This enables the operator to quickly compensate for any irregularity in rail distribution and swing his load at the same time without fear of the machine overturning.

The Parsons system of counter-weighting does not interfere with moving the crane forward or backward.

The Parsons Rail Crane with its extensive boom is particularly adapted for unloading rail from Gondola Cars. Plenty of clearance and reach for a 39-foot rail. Its 40 H.P. Waukesha Motor supplies plus power for handling loads and plenty of speed for traction.

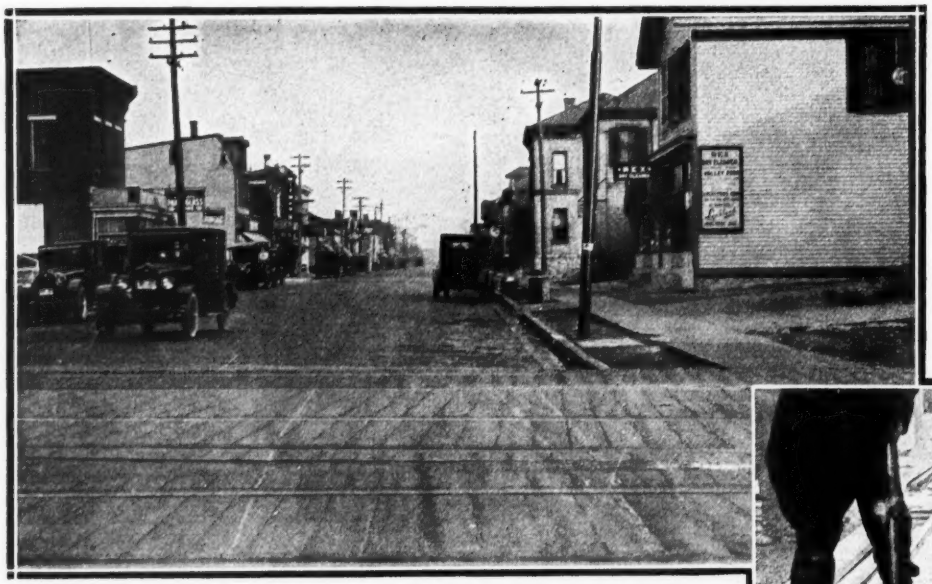
When clearing for trains, the Parsons Rail Crane may be moved off the track on to a set-off station in less than five minutes. Or if a siding is to be made, the speed is 20 miles and more per hour.

Refinements of design are found at every point of the Rail Crane. The Power Swing is operated by worm and worm gear — a vital safety factor.

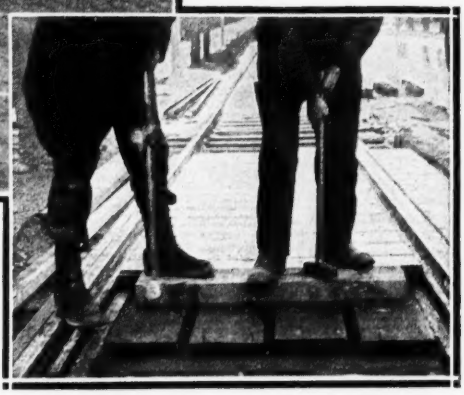
Write for Bulletin 26-C, which gives details of the Parsons Rail Crane. We will be glad to send you a list of railroad officials who are using Parsons Rail Cranes.

PARSONS RAIL CRANE

THE PARSONS COMPANY **Newton, Iowa, U. S. A.**



This finished job is smooth, neat and trim when Carey Elastite Preformed Track Pavement is used.



The preformed slabs arrive on the job cut to fit—and are easily and quickly installed in any temperature.

Track and pavement become one unit

with this better method of paving grade crossings

NO NEED to worry about pavement failures if you use Carey Elastite Preformed Track Pavement. For with this improved method of paving grade crossings, the track and pavement become one unit—water and frost are shut out—disintegration is stopped before it has a chance to begin.

The Carey method consists of rail filler and pavement slabs about 2″ thick—both made from a fibrous asphaltic compound that actually knits and heals under traffic. The preformed slabs, cut to fit, are delivered on the job ready for installation. The fibre-reinforced mass will not creep or disintegrate. And it can be easily and quickly applied in mid-summer heat or zero weather. It is very reasonable in first cost—and surprisingly durable.

The complete story of this improved method of paving grade crossings is well worth knowing. Write for it—today!

THE PHILIP CAREY COMPANY
Lockland, Cincinnati, Ohio

Carey Elastite
PREFORMED
TRACK PAVEMENT

"Knits and Heals Under Traffic"

A Mouthful at Every Bite

OWEN BUCKETS are digging buckets. Every operating feature of their construction is designed and placed to increase their ability to dig—their ability to get a heaping load every time the closing line is overhauled.

And the distribution of weight in Owen Buckets is proportioned to insure an additional advantage to their tremendous digging power. More than sixty percent. of the total weight is placed low in the center of construction so that every pound directly counteracts the upward pull exerted to close the bucket. In this way an Owen does not scrape over the material, but actually digs down as though it were anchored to the ground.

Owen Buckets are digging buckets which—like the vicious lion with steely jaws—get A Mouthful At Every Bite.

Write for illustrated story of Owen Buckets. A post card will bring it.

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OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen Buckets

Railway Engineering and Maintenance

Volume 22 June, 1926 Number 6

ARE YOU GETTING THE TIES YOU NEED?

AT THIS season of the year when tie renewals are the major activity of the track forces on most roads it is pertinent for roadmasters and division engineers to ascertain whether the ties they are getting are of the quality they need for the service. There has been a general recognition in recent years that better ties are demanded by modern traffic and as a result larger sizes are being specified and the specifications are being made more exacting. Equal progress has not been made, however, in the adoption of measures to insure adherence to these specifications. Laxity in inspection and enforcement of specifications still prevails on many roads with the result that these lines are not always securing the ties that their executive officers think they are.

Since ties constitute the largest single charge for material in the track department those responsible for the economical conduct of this work have a direct interest in knowing that the specifications are being adhered to and have a right to insist that the ties that they receive comply with the specifications. This requires a more intimate knowledge of the specifications themselves than many roadmasters possess. They must know, for instance, that a Grade 5 tie must be 7 in. thick and 9 in. wide *on top* and a Grade 3 tie, 6 in. thick by 8 in. wide or 7 in. thick by 7 in. wide, and that the maximum tolerance permissible in these dimensions is ¼-in. They should also inspect the ties sufficiently to satisfy themselves that they are free from decay, splits and other defects. It is well worth while for maintenance officers to inspect the ties being put in their tracks with sufficient thoroughness to satisfy themselves that they comply with the specifications.

ELIMINATE THE UNFIT

IN AN address before the Maintenance of Way Club of Chicago on May 19, an abstract of which appears on a following page, C. E. Johnston, vice-president and general manager of the Kansas City Southern, suggested three measures for improving the personnel as follows: (1) Employ a better class of men; (2) educate those retained in service; and (3) discharge the vicious and incompetent. Mr. Johnston indicated further that in his opinion the last measure was the most important. Yet frequently it is given little or no attention.

It has long been known that a decayed apple, if left in a barrel of good fruit will in time infect all of the others and lead to their destruction. In the same manner and just as truly, one vicious member of a gang will so undermine the loyalty and enthusiasm of the other men as to destroy their efficiency.

Men in railway service enjoy a greater security of employment than in many other industries. For this reason there is a tendency to tolerate disturbers here that would not be permitted elsewhere. This practice should not be condoned, for the man who works against the interests of the company from which he draws his livelihood has no rightful claim to its protection.

A contented and harmonious force is essential to efficiency in any organization. It should be the aim of every foreman and supervisory officer to build up such a force. To do this he must remove all causes of discontent. Where a man does not respond to considerate treatment his services should be dispensed with, for otherwise it may be necessary to let an entire gang go. The elimination of vicious men permits of no half-way measures, and while treating men with absolute fairness and impartiality no tolerance should be given the man who has demonstrated his unfitness. The sooner the services of such a man are dispensed with the better will it be for the remaining men as well as for the company in whose employ they are.

TEAMWORK IS NECESSARY

BRIDGE engineering is the most exact of applied sciences and as a consequence more complete dependence is placed on mathematics and less is left to so-called judgment in the design of bridges than in the planning of almost any other class of engineering work. While this has been true for three-quarters of a century as far as it concerns design, it has not applied to construction for nearly so long a time.

In more recent years, however, there has come a general realization that the development of effective plans for erection, in cases involving any departure from ordinary routine, requires the service of the engineer skilled in this preparation of falsework plans and the formulation of a complete outline of erection procedure step by step. This does not mean that the steel bridge foreman or superintendent is left out of the picture. On the contrary, he is invariably called into consultation, not only for the purpose of obtaining his ideas but also to have his criticism of the plan advanced by the engineer and his suggestions for any modifications, which in his opinion, would improve the plan.

The reason for all this is plain. Bridge erection involves the handling of heavy loads on temporary supports. It is not only necessary to know that the crane or derrick car is stable against overturning in all the positions in which it is employed but it is equally important to make sure that the falsework is strong enough and has adequate stability under all conditions of load.

Interruption to traffic incident to bridge erection is a serious matter. It is essential that each step be planned in advance to insure that it co-ordinates with those that proceed and follow, but of equal importance is the requirement that a fairly accurate estimate be made of the time required for each operation. The only way to insure that these steps are understood and that every condition is taken into consideration in work involving any considerable degree of complexity, is to draft a complete outline of the procedure, describing each step in turn and frequently providing sketches showing the more essential stages of the work, the position of erection equipment, etc.

That this is now generally considered necessary in work of an involved character is no reflection on the man who must in the end be depended upon to carry the work to completion—the erection foreman. Rather it is an example of teamwork of the highest order.

THE IMPORTANCE OF ACCURATE RECORDS

IN DISCUSSING the undoubted advantages to be gained by winter maintenance work, great stress is laid on the stabilization of forces which this practice promotes, with the result that trained men may be kept continuously in the service. According to many intelligent foremen, a trained, loyal laborer can perform twice as much work as a new man not familiar with the work, with the result that the cost due to labor turnover on account of the inability to keep the trained men in the service is enormous. These assertions are undoubtedly correct in a general way, but when an endeavor is made to obtain figures to support the statements, little is usually available except vague generalities or data of such limited extent as to be of no value in establishing the mathematical accuracy of the general proposition. The intangible benefits are of no small advantage, but after all, arguments for what is a radical change in policy on many roads are more convincing if they can be backed up by actual figures.

Track foremen are not usually trained cost accountants and the inadvisability of adding to the foreman's burden by demanding complicated reports is recognized. Unfortunately, the methods of the accounting departments of the railroads do not lend themselves to furnishing this information in the detail that is necessary, so that the data to be secured from that source are usually only an approximation which are of little use in an analytical study of the question. Recognizing the importance of accurate cost data, a committee of the American Railway Engineering Association is working on the formulation of reports which will be comparatively simple and yet will furnish the information in useful form.

Pending changes in reports and methods of accounting much can be done by the foreman and others in supervisory capacities to obtain these costs in sufficient detail to permit analysis. In approaching the subject one must be absolutely honest with himself as well as with his employer, whose interests he must safeguard. The costs must be alayzed, not with the view of supporting some preconceived idea, but of learning the facts and of using them as a basis for possible changes in methods that will introduce economies. To be of any value the records must cover the entire cycle of work for a year. With such information at hand it may happen that certain items of work performed in winter may show higher costs than when done in summer, but on the other hand it may possibly be shown that these same higher costs have made possible greater savings in certain other items that must be done in the summer, so as to show a net gain for the season. It may also happen that some classes of work performed in winter will show actual savings over the same work in summer and in such cases it will be comforting to have the actual figures to sustain one's arguments.

The cost of maintaining a section, a division, or an entire railroad must be based on the figures for each year, covering a complete cycle of work, so that a basis may be obtained for the comparison of costs with other years. One may point with pride to a record made on a certain day or for some other limited period but after all it is the daily average that counts. The one big day's record helps to raise the average to a smaller extent than is usually recognized, for its excess production must be divided by the total number of days expended in the same class of work during the entire season. It is related of a certain superintendent of bridges that in the early days of concrete mixers, he was sent to inspect and report on a mixer which had been recently installed. After looking over the layout he asked the man in charge concerning the daily output. "Well," answered the foreman, "we put in 200 yds. one day last week," to be met with the further query: "Fine, how much did you put in the next day?"

To be of the most value, maintenance costs should be set forth so that they may be allocated correctly for each item of work on each section. To compare a railroad with a manufacturing concern, the sections may be considered as separate factories. The successful manufacturer must know not only his unit costs as a whole, but the unit costs for each factory, so that the proper steps may be taken to maintain the desired ratio between production and costs. In one respect the manufacturer with several factories is more fortunate than the railroad for he can shut down his unprofitable factories if he desires, while the railroad must be kept in operation at all times.

THE OPENING OF THE ACTIVE SEASON

ACCORDING to statistics furnished by the individual railways to the Bureau of Railway Economics and compiled and made public by it, the Class I roads of the United States spent $90,800,000 for capital improvements to roadway and structures during the first three months of this year, or $19,200,000 more than during the corresponding period a year ago. During the same interval they spent $184,294,582 for roadway and structures work chargeable to operation, an increase of $11,263,077 over the amount spent for the same purpose in 1925. These figures, which show a combined expenditure of over $30,000,000 more than during the first three months of last year, not only indicate the present activity of the railways in the improvement of their properties but also evidence the growing practice of the roads to carry on more work during the winter.

Insofar as these figures reflect the increased activity of the roads in improving their properties they show the readiness with which railway managements have taken advantage of the improvement in their credit as a result of more favorable earnings to enlarge and strengthen their lines in order to reduce the cost of operation. At no time since the war until now have the earnings approached the figure fixed by the Interstate Commerce Commission as a fair return. As a result investors have not looked with favor on railway securities and the railways have been unable to finance needed improvements at reasonable rates of interest. With the improvement in their earnings during the last year this situation has changed, and the roads are now authorizing numerous expenditures that they have long carried in their budgets. These involve additions to some facilities and the recon-

struction of others. They also include new and heavier rail, more ballast, heavier bridges and other items comprising a stronger and more readily maintained track construction.

To no inconsiderable degree the increase in expenditures also reflects the growing practice of doing more track work during the winter. This is shown by the fact that while the total amount spent for roadway and structures improvements increased 27 per cent over 1925 the $39,900,000 spent for additional tracks, heavier rail and more ballast shows an increase of $11,400,000, or 40 per cent. While the data made public do not separate the expenditures for new rail and ballast from those for additional tracks, it may safely be assumed that the former have increased at at least as rapid a rate as those for additional tracks.

Regardless of the explanation for the additional expenditures during the first quarter of this year, they indicate that 1926 will be an active year on the railways. Maintenance of way officers must plan accordingly.

GIVE MORE ATTENTION TO PAINTING

FULLY HALF of all paint sold in the United States is applied by amateurs, a classification which includes the man who paints his own home, the employee who is required to do painting at odd times and the man who is given a job as a painter but has had no training in the trade. Under the plan of seasonal painting which prevails in the maintenance of way department on many railroads a large percentage of the men in the paint gangs come within the amateur class. The green man in the summer paint gang, if he is ambitious, takes advantage of this opportunity to gain knowledge and skill in the trade and when he is laid off in the fall takes up house painting or some other field that offers more permanent employment. The man who is not ambitious will remain an amateur indefinitely and whether he is rehired in the spring or replaced by a new man without experience, the railroad is suffering the loss accruing from the employment of an inefficient workman.

Another shortcoming of railroad structures painting is that few men in supervisory positions have had training as painters or paint foremen. Consequently the paint gang leader is rarely under the direction of an officer who has a knowledge of painting such as would come only from actual work at the trade. Paint foremen are therefore left more to their own devices than are the carpenter, concrete and pile driver foremen. It is obvious, therefore, that painting cannot receive the same degree of critical attention from the supervisor or that the requisite for good painting as to equipment, men and organization, will be accorded as careful consideration as other trades in bridge and building work.

It was for the purpose of eliminating these inherent defects in the plan of conducting bridge and building painting that the Chesapeake & Ohio undertook a thorough study of the situation on that road with the result that an entirely new plan of organization and system of control was developed and put into effect. How this was carried out and the benefits derived are related in an article appearing elsewhere in this issue. Without doubt, the most important feature of this plan is the opportunity it affords for the maintenance of a permanent, all-year force, but another significant detail is the employment in an administrative and advisory capacity of a man who has had a long experience in handling practical painting work and who is therefore thoroughly qualified to judge not only of the efficiency of the foremen and their knowledge of painting, but also of the character of the work turned out by their gangs.

New Books

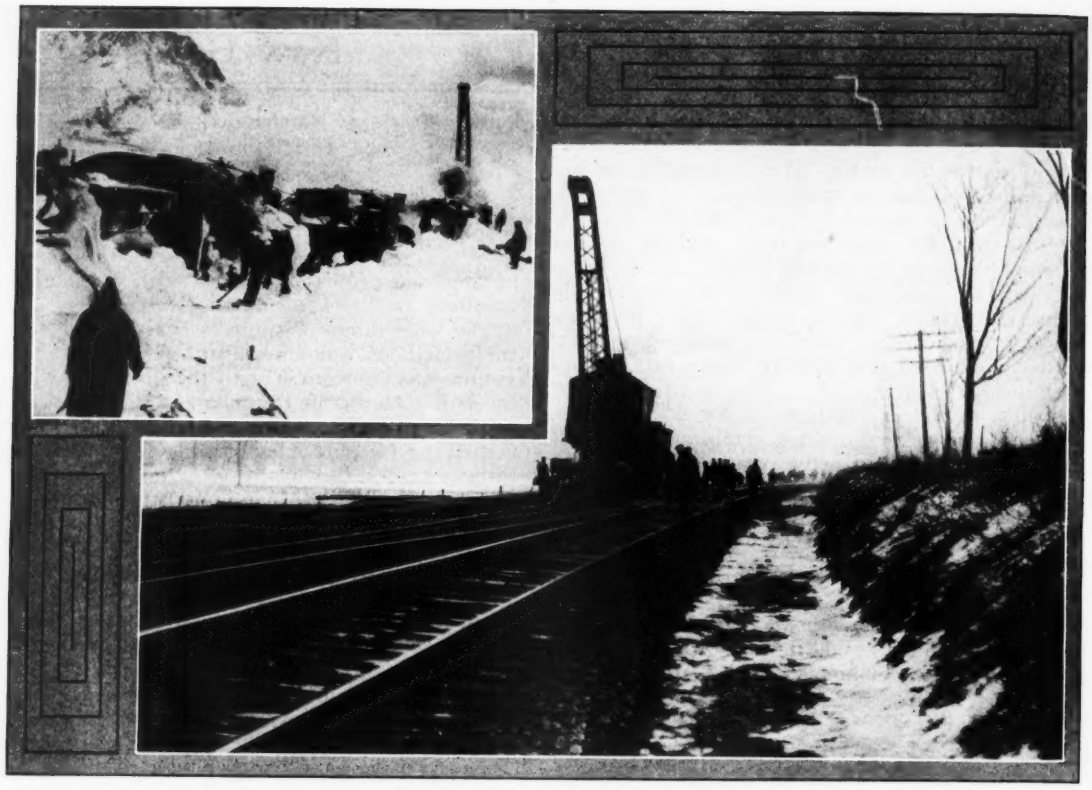
Railway Track and Maintenance. By E. E. Russell Tratman, associate editor, Engineer News-Record. 490 pages, 6 in. by 9 in. Bound in cloth. Published by the McGraw Hill Book Company, 370 Seventh avenue, New York. Price $5.

The title of this book does not indicate the full scope of the subject covered, for it deals not only with track and its maintenance but also with other features of the fixed property, such as coal, water and cinder handling facilities, terminals, stations, etc. Because of the wide range of subjects covered and because of the enormous amount of information available, the author was confronted with the problem of determining how to limit the treatment of the various subjects to a book of 490 pages; and while he has presented something on almost everything that has to do with railway tracks, this has resulted in a rather brief presentation of subjects of vital importance to the practical track man.

The book is primarily descriptive of the physical structure and of the organization and methods used in its construction and repair. In general it would seem that the book is designed primarily for the student or for the young man entering railway service who must gather as quickly as possible a general knowledge of railroading in so far as it relates to his duties in railway engineering and maintenance of way work. The treatment of some phases of the subject is confined to a rather elementary outline. Only a relatively small amount of space is given to the equipment used in the performing of work, and in only a few cases has the author mentioned the names of proprietary materials and devices.

The book is an enlarged fourth edition of Tratman's "Railway Track and Track Work," the first edition of which was published in 1897, and a careful examination of the book shows that the author has made every effort to bring the subject matter up to date. An introductory chapter on the general nature of track and its maintenance is followed by chapters dealing with roadbed and ballast, ties, rail, fastenings, etc., and other physical features of the fixed property. The second half of the book carries the sub-title "Maintenance Work and Economics" and deals with organization and methods covering not only track maintenance but also "bridge work and telegraph work," "signals," "improvements and betterments," "emergency work," "records, reports and accounts," etc. Frequent reference is made to the work of the American Railway Engineering Association and to the standards and practices of specific railroads, the name of certain railroads appearing with considerable frequency.

ANOTHER CONFISCATION SCHEME.—A bill declaring all railroad, telegraph, telephone and express properties in the United States used in the transaction of interstate business to be the property of the United States government under conditions of acquirement set forth in the bill, has been introduced in the House by Representative Berger of Wisconsin, as H. R. 11,944. It provides that Congress shall select a commission of twelve persons "known generally as experts in the valuation of such properties" to supervise an appraisal to be made by a subcommission of five experts in each case, and that government 4 per cent bonds shall be exchanged for the existing securities at a pro rata value based on the values ascertained.



"Winter" Is a Term of Widely Varying Significance

Is it Practicable to Increase Amount of Winter Work?

Two Prize Winning Papers and Others Submitted in the Contest Discuss This Important Subject.

THE increasing interest in winter work as a means of effecting economy and efficiency in track maintenance from the standpoint of an orderly, well-balanced program and its corollary, stabilized forces, are shown in the papers submitted in the contest announced in the February issue of *Railway Engineering and Maintenance* on the practicability of increasing this kind of work. Twenty-three papers were received and were submitted to the judges, who were W. L. Ekin, chief engineer maintenance of way of the Western Region of the Pennsylvania; J. G. Bloom, engineer maintenance of way of the Chicago, Rock Island & Pacific, and M. Donohoe, general supervisor of maintenance of the Chicago & Alton. The judges awarded the first prize to Charles Lepperd, supervisor, Reading, Pottstown, Pa., and the second prize to J. W. Powers, supervisor of track, New York Central, Rochester, N. Y. Among the other papers submitted, which in the opinion of the judges deserved special consideration, were those by A. M. Bouillon, assistant engineer Chicago Terminal Improvement, Illinois Central, Chicago; J. P. Costello, roadmaster, Atchison, Topeka & Santa Fe, Pueblo, Colo.; G. S. Crites, division engineer, Baltimore & Ohio, Baltimore, Md.; J. D. Keily, supervisor maintenance of way, Chesapeake & Ohio, Russell, Ky., and Cyrillus Heim, section foreman, Chicago, Milwaukee & St. Paul, Elkhart Lake, Wis. The prize winning and some of the other papers are presented below, while others will appear in later issues.

First Prize—Weather Conditions Usually Permit Much Work to Be Done

By CHARLES LEPPERD
Supervisor, Reading, Pottstown, Pa.

Winter maintenance work depends upon climate. This discussion refers to the weather conditions of southeastern Pennsylvania, where snow covers the ground continually for eight or ten weeks perhaps only once in six years, and during the other five years conditions may vary toward those of the past winter, when much of the snow melted before the following snowfall. During January, 1926, there were only three snowstorms; during February, eleven days when track forces were engaged in handling snow, and only one serious snowfall during March. The winter was too short for the work which might have been done economically.

In this locality, while it is possible occasionally to place siding ties during the winter, it is never advisable except as an emergency measure, but the distribution of ties may be done economically in winter.

At this date, April 1, 90 per cent of the tie allotment has been received and piled in small piles or laid in rows, one end resting upon the tie in front and the other on the ground, along the ballast shoulder. Except in tunnels and rock cuts, all main track ties have been delivered to the spots where needed. This will permit the diversion of work trains during the coming spring and summer to other work.

During the winter bolts have been tightened and bolts and nutlocks replaced where necessary. This work should also be done on sidings. During the remaining three seasons the section foreman can find so much work that cannot be done during the winter that he does not like to spend the time required to tighten siding bolts, and it is very important that he have this work out of the way before spring. Regaging and adzing to adjust canted rails are other items of work that may be done almost, if not quite, as economically during the winter. Almost every section foreman can spend profitably one month in tightening bolts and another month in regaging and adzing during the winter season.

The biggest item of track work which should be done during the three or four winter months is that of rail laying and switch renewal. During January, 1926, our track forces were engaged in snow removal work 3 days and laid rail on 19 days, during February 11 days were spent on each item of work and during March until the 22nd of the month 2 days were spent removing snow and 11 days laying rail. The work of laying rail was done by a small extra gang assisted by as many section gangs as were necessary to provide 70 to 80 laborers. No snow melting device was used, but on several occasions snow was flanged and cleaned in advance. Approximately 1,000 tons of new 130-lb. rail was laid and a corresponding mileage of 100-lb. rail removed during each month. During two of the three months the work was delayed by the lack of fittings or more rail would have been laid.

The subject is that of increasing the amount of winter maintenance work. If it is practicable to lay 1,000 tons of rail with a 100 per cent increase in force, we may well consider the question of a more uniform track force the year round. Track labor has too long been considered unskilled. The reason has been temporary employment, which fails to attract a better class of laborers, so that a large part of our maintenance labor has been correctly termed unskilled. Efficient rail laying in winter or tie tamping in summer requires as much intelligence and proficiency as does firing an engine, and the labor of an experienced track man should be classed as semi-skilled. His wages should be higher than those of the common laborer hired to shovel ashes or clean ditches. Increasing the size of gangs in the summer and paying the green men the same wages as the experienced man receives reduces the labor output of the older men. With the increasing labor shortage and its attendant labor turnover, we cannot expect to attract and hold intelligent labor unless we can offer it steady employment 12 months in the year, and to enable us to do this increased winter work and a uniform track force the year round is the remedy. The perennial objection to a uniform force has been the lack of winter work, but rail laying will provide work for the forces on all winter days when their services are not needed to remove snow.

For the past few years we have had a uniform carpenter and mason force, and its result has been steady employment for steady men. The same practice should prove economical with track forces because it will reduce the labor turnover, attract the best of the unskilled men, who will become semi-skilled and increase the efficiency of the entire track force by increasing the production per man hour. If the annual maintenance of way allotment for labor should be divided into equal portions for each month, the experiment should cost nothing and would undoubtedly prove the value of a uniform annual track force and its corollary, additional winter track work, but it is contingent upon "selling" the idea to the management.

Second Prize—Winter Work Has Demonstrated Its Value on Northern Roads

By J. W. Powers

Supervisor of Track, New York Central, Rochester, N. Y.

The possibility and practicability of increasing winter track work is principally a matter of climatic conditions. It is evident that in the southern states it is possible to do all kinds of track work during the winter months, while in the extreme northern states or localities where there is frost in the ground it is impractical to do many kinds of track work, such as ballasting, surfacing and lining track, renewing ties, etc., during this time of the year. There are, however, many states where certain kinds of track work can be done as economically and well during the winter months as during the summer. Proof of this is found in the fact that a large amount of work that was formerly done in the summer has been transferred to winter in the middle and northern states.

Many officers, after they have given the matter careful consideration and observed the results obtained on the railroads in the above mentioned states, have reached the conclusion that much of the work now being deferred until summer can be so arranged that a large portion of it can be done as cheaply and satisfactorily in the winter, despite the adverse weather conditions.

The principal reason for doing as much track work as possible during the cold season is that it assists materially in lightening and advancing the work of the following spring and summer; also a much more adequate and efficient labor supply is available, as many kinds of work are at a standstill, especially in the northern states, at this time of the year.

The traffic on most roads is considerably lighter at this season, consequently the work can be done with less interruption to traffic. The systematic assigning of work which can be done during the winter months will permit a more evenly balanced force allowance during the entire year. The practice of reducing forces has been in vogue so long that it is strongly entrenched in the minds of many vitally interested. No condition detracts from the efficiency of the maintenance of way department more than the large turnover in men, much of which is brought about by the large reduction in forces at the approach of winter. Thus the saving effected by the holding of experienced men in the service, in most cases, outweighs any loss in efficiency that may result from adverse weather conditions. This would also reward the industrious and willing laborers, many of whom, under the present system, are laid off during the first cold spell, and would aid us tremendously by supplving us with better material from which to secure our future foremen.

It must be admitted by all who have given the matter careful consideration that it is practicable and profitable to defer rail renewals to autumn or early in the winter in the temperate zone, as the tracks are in the best line and surface for it at this season of the year, because the annual track inspections are completed on many railroads at this time and tem-

perature conditions for the men engaged in the laborious work of rail renewal are usually most satisfactory.

It is true that it is sometimes necessary to make some changes in the methods. If rail is to be laid where track is ballasted with cinders or gravel, sufficient ballast should be removed before the ground freezes to permit the adzing of the ties and the rolling of the rail, if necessary, and to make it possible to apply rail anchors. If much snow is expected, spikes, bolts, angle bars, tie plugs and rail anchors should not be distributed too far in advance. Where locomotives are used in connection with steam cranes for loading, unloading and laying rail, it has been found advantageous to equip a locomotive with steam pipes for the purpose of thawing snow and ice. When a locomotive crane is used to pull out the old rail and set in the new, the presence of frost in the ground is an advantage, as there is no danger of disturbing the ties. This operation will require considerably more care in the summer when the ties are loose, to avoid the danger of lifting them up or otherwise disturbing them.

In addition to laying rail, it is also possible to renew frogs and switches and to distribute the next year's material, care being taken to place it as near as possible to the point where it is to be used. Other work that may be done to advantage includes gaging track, tightening bolts, and the renewal of broken or defective angle bars, putting in tie plates out of face, unloading cinders and widening embankments, ditching and leveling off material which has been removed from ditches, and cutting brush along the right-of-way.

In many states it is compulsory to clear the right-of-way of noxious weeds twice a year, and as this work has to be done at a time when track forces are busily engaged in other work, it is better to defer the cutting of the brush until winter, when more time is available and it can be grubbed out by the roots and burned so as to prevent it from growing again.

Fencing can also be done to good advantage during the winter. However, in building wire fence the work of stretching the wire should be deferred until warm weather, for if the wire is stretched during cold weather it will become too loose as the weather gets warmer.

Of course, there will be times in many states when the work enumerated above cannot be done, due to severe cold weather or heavy snow storms, but at such times the men are available for removing snow, etc. Otherwise it would be necessary to employ, at a higher rate of wages, inexperienced men, many of whom would not accomplish 50 per cent of the amount of work that could be done by the regular forces.

The writer is located in a territory noted for the frequency and severity of its storms, yet, despite this fact, he has found it possible to accomplish the work referred to during the winter season and with such excellent results that he is firmly convinced that it is unnecessary and unprofitable to defer until summer work which it is possible to do in winter.

The Disadvantages of Winter Work

By J. B. Kelly

General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Minneapolis, Minn.

As location is a factor in the consideration of this subject, I base my views on conditions in the northwest region from Chicago to the Canadian boundary, where comparatively mild winters are the exception and where my experience of a number of years shows that winter track work beyond the actual work of handling snow and ice, inspections and shimming, etc., is directly opposed to economy in any sense of the term, whether for the purpose of keeping experienced men in continuous service or for other reasons.

In support of my opinion I recall a construction project in the vicinity of Minneapolis a few years back which was put in service about January 1, and of which I was in general charge. The authorized force was about 200 men and the work consisted of top grading, laying track and ballasting with gravel. Ordinarily we figure on fair construction weather until about Thanksgiving, but in this particular year winter set in early, with an 18 in. snowfall early in October, and from then on the elements got the better of us. The turnover in crews was heavy by reason of the cold weather, especially in connection with track work. The men worked clumsily and, in addition to winter clothing, bandaged their feet with gunny sacks, paper and the like, until they could hardly get around. Tools were easily broken and first class white oak cross ties were split by spiking, due to the cold.

It was carefully planned to load and distribute from the pit, 50 miles away, only the amount of gravel that could be put under each day. This worked well for a while, but an accident held up 60 cars in changeable weather, including rain, snow and low temperature, so that the material arrived in a frozen state. Part of it was placed in roundhouses for thawing and three extra engines fitted with steam hose were brought into service to thaw the material so that it could be unloaded, but this was not entirely effective and the plowing off of the material was accompanied by the destruction of the sides of the cars. After unloading plows were run through the cars a number of times until the plows and cars looked like wrecks, it was necessary to set them on a siding and remove the frozen ballast by hand. On account of these conditions the work was brought to a close.

Another instance of winter work was the taking up of a few miles of logging road in Wisconsin where it was required to recover the rail and fastenings. The work was performed in December and January, contending with two feet of snow that drifted continually, also with the usual sub-zero temperature. The camp outfit on wheels was especially well provided, but the men who could work in logging operations did not stand the cold on track work and consequently quit after a few days, disorganizing the gang by the large labor turnover. In both the foregoing instances the work cost from 50 to 90 per cent more than it would in open season, and I contend it is the same with maintenance work of almost any kind.

This past winter was peculiarly free of snow northwest of Minneapolis, and at least one of the lines may have obtained unusual winter results in relaying rail, but this will be the exception, and even with no snow conditions must be entirely favorable to warrant winter work.

I do not know of any reason for increased expenditure for winter track work when not necessary, except possibly in the case of lines with congested traffic during the open season. Labor expended in removing snow and ice in connection with any work is a loss. Cutting brush in winter is not as effective in exterminating it as when it is done in August. Fencing which involves the removing and placing of posts in frost is also uneconomical. For these reasons I am not in favor of any outlay in the winter beyond that required for the ordinary maintenance work.

We know that inducements to attract regular experienced labor are necessary, but these should be

provided for by housing, rates of pay, or something on the order of a bonus system in anticipation of the winter months instead of the payment for labor which accomplishes little in results.

A Program Based on Experience

By J. P. COSTELLO

Roadmaster, Atchison, Topeka & Santa Fe, Pueblo, Colo.

In the opinion of the writer ordinary maintenance work such as is handled by section forces can be increased in the winter time on most railroads without excessive cost and with great benefit to the yearly round of maintenance. The advisability of attempting heavy extraordinary maintenance or construction will depend on a number of things, such as climatic conditions, the desirability of retaining experienced workmen and foremen, the necessity or urgency of the work to be accomplished, and the value of an organized force, larger than a section gang, for emergency work such as that necessitated by weather conditions.

We have found after a number of years' observation that there are about ten items of work which can be handled by the section crews in the winter time and which must be done at some time during the year. These are about as follows: (1) Cleaning right-of-way, (2) cleaning station grounds, (3) side track tie renewals, (4) repairing fence, (5) spike-lining joints, (6) tightening bolts, (7) tightening screw and cut spikes, (8) cleaning cuts, (9) cleaning drain boxes, (10) repairing insulated joints.

The original program called for only four items, but new items were added in different years, and one original item was divided into "cleaning right-of-way" and "cleaning station grounds." A progress chart was prepared, and as the different items were completed and reported they were crossed off in the square and the date of completion recorded. Occasionally prints were sent out so the foreman could see the progress made elesewhere and thus determine whether or not he was keeping up with the program. A general letter was put out each year, instructing the foreman. During the past year no chart was used, as the foremen now seem to like the plan of having a more or less definite objective to work to. Some of the items may not appear to be of extreme importance and perhaps are not so in themselves, but they *are* important in the fact that to handle them at irregular times during the more active months interferes seriously with the continuity and the satisfactory carrying out of the very important work of main track tie renewals, surfacing, etc.

Some of the items mentioned above are usually considered as things which we "have with us always." This is not correct; for instance, tightening bolts (the new heat treated bolts with good nut locks) can be taken care of by one thorough "going over" every year; indeed, it is not necessary to tighten every joint at that. Foremen are required to see every joint, however. Insulated joints can usually be taken care of in this territory with one thorough repairing per year and by not waiting until they are on the point of failure to make the repairs. To depend on track walkers to take care of bolt tightening and insulated joints is a good way *not* to get these things done.

In this territory, at some time during nearly every winter, it is possible to set fence posts and to make side track tie renewals without extreme difficulty, and even if there is some difficulty it is better to have these jobs out of the way for the more active season.

It has been found impractical to expect all gangs to be engaged on the same class of work at the same time on account of different weather conditions. The altitude of this territory varies from 4700 ft. at one end up to 7200 ft. in the middle and down to 5200 ft. at the other end, so that one foreman might be able to make side track tie renewals while another might be better employed tightening bolts. (It might be interesting, at this point, to say that it is not always coldest at the highest point. I remember one occasion when the temperature at the lowest point was 12 deg. below and at the highest point was 36 deg. above zero.)

I believe fence repairs can be handled more economically and the fence kept in better shape by a small fence gang than by section gangs, but the management believes differently, and therefore it is best to have a place for this item of work on the program.

Our winter section forces are adequate for our needs; usually about four men to the section. The carrying out of a uniform program of winter work presupposes a condition such that it is not necessary for the section gang to be continually running from one weak place in the track to another. The program outlined above applies to outside sections and not to our yards. A program could be worked out for any district on any road. Conditions here are not ideal for a uniform program, on account of variable climatic conditions. The program above outlined might not be suited for other locations, but it has been in actual practice here, with modifications, for ten years. It has been satisfactory and has stimulated the interest of the foremen.

The use of extra gangs in winter time has been discussed by the railroad associations a great deal, but the writer has never been an enthusiast for winter extra gang work, principally for the reason that "physical discomfort," as one roadmaster puts it, seriously limits the efforts of everyone connected with the work. Extremely cold weather, snow, cold rains, etc., make the work unsatisfactory and uneconomical. Heavy extra gang work should only be undertaken when necessity or extreme urgency requires it. Two winter rail laying jobs which I have in mind were not highly satisfactory to the one who was in charge even though the management was tolerant.

The "laying off" of extra gangs or changing their work tends to break up the continuity or sequence of the work and is attended and followed by loss of time and money. It is of course different from the small and mobile section gangs. Heavy winter work conflicts with the generally accepted principle of the value of seasonal work. Naturally costly work ought to be done at the time best suited for it. A contractor having a job extending over more than one year would try to arrange that work on seasonal lines, giving particular attention to the winter season.

If it is desired to retain organized labor gangs and their foremen for the next season, let them be moved to that part of the railroad best suited to winter work, where this is possible. If the winter months are used to the best advantage in seeing to it that equipment, tools, outfit cars, etc., are put in order and that necessary requisitions for materials and tools are made and filled, and the material for work is assembled, the time will be well spent.

If conditions require that a considerable organized extra force be retained for emergency work or if labor conditions are such that it is desirable to retain the gang organizations in a certain territory, the gangs should be employed at work which does not demand high quality and where continuity is not of great importance. In general the writer favors the yearly cycle of work with a breathing spell in the winter time.

Winter Work Will Solve the Labor Problem

By Cyrillus Heim
Section Foreman, Chicago, Milwaukee & St. Paul, Elkhart Lake, Wis.

While practical track work during the winter months is largely a matter of climatic conditions, there are only minor reasons against the practices, and the advantages are many. From my ten years of track work I have drawn the conclusion that there are many advantages in winter work. One of the most important is the question of labor. As every foreman knows, good track men are scarce and hard to find. The practice of working five or six men during the summer months and one during the winter leaves the other men without work at a time of the year when jobs are scarce. As a result the men who are any good seek employment where they are assured of steady work, making it necessary to start each season with but one trained man, and the balance men who have to be instructed in every move.

Another advantage is that although there are storms that hinder work during the winter, in such cases the men are needed to handle snow, and any foreman who has had to hunt up men to go out and shovel snow on a stormy day can testify to the results. With one man to handle the motor car, there is a chance of being caught by every train that is met, especially when a train is met on a high fill, or even at a set-off when covered with snow. To pull a 1,000-lb. car up a snow-covered bank is a job for four good men.

Several men are needed in changing a rail in stormy weather, where protection is needed, as there is no guarantee that a flag will not be hidden by drifting snow or a lantern blown out by wind. The only safe way is to use flagmen.

The amount of work two men can do is restricted very much. Much of their time is taken up in handling snow, cleaning switches and crossings, changing broken rails and fastenings, unloading and handling material, and the important work of gaging and shimming track is often neglected through lack of help. As everyone knows a low joint, if not quickly corrected, will cause the rails to bend, and then the rails will usually break, whether the joint is raised or not. Or, stated in another way, a low joint which has developed can be corrected in summer by raising and tamping, in winter by shimming, requiring the labor of one-half hour for two men, or, including foreman's time, about 40 cents. If neglected for any reason, the results are that both angle bars and the two rails bend down; if on a curve the thrust of the cars spreads the rail, the rails are liable to break and in any case they have to be removed. To make repairs, then, we must change both rails, apply new angle bars, regage the rail, load and ship the two rails and also tamp or shim the joint. Our labor has amounted to a full day for two men, at a cost of seven dollars plus the cost of material used and of handling the material recovered.

The wear on a track during the winter is fully as great as during the summer months, and while there are no ties to be renewed, the handling of snow and ice requires quite as much time. The answer seems to be a uniform crew throughout the year. This crew should consist of three men and a foreman for single track main line sections. Such a crew will do more work than double the number of new men, through being trained and familiar with the tools and material used, and the work will be done at the proper time, which should show a saving of one-half in the amount of material used. The saying that "an ounce of prevention is better than a pound of cure" is nowhere better illustrated than on the track. Any break or weak spot must be repaired or it will spread quickly. A broken bolt today may mean a broken rail tomorrow. A low joint today may develop into a spread rail tomorrow, and a derailment the next day. The foreman with one man can only repair those places which need it the most, with no chance to make minor repairs that would save time or material later. There are of course certain branch lines with two or three trains a day, where one man and a foreman can do the work, but they are exceptions. Another thing is that the difference in conditions on the sections is not taken into account. On the average, a curve will usually require twice as much work as a tangent. Curves usually are laid at the base of hills or along creek bottoms where the roadbed may be soft and require twice as much work to keep in surface as a track laid on hard, level ground. Such conditions should be considered if more than the minimum of three laborers are used in renewing ties or surfacing track. Often foremen are considered inefficient for the reason that their sections may require more work to keep in condition than certain others.

Large Appropriations Made for Roadway and Structures

THE CLASS I railroads of the United States authorized capital expenditures for roadway and structures and for new rolling stock amounting to $822,000,000 up to April 1 of this year, according to a report submitted by the Bureau of Railway Economics to the Board of Directors of the American Railway Association on May 18. These authorizations exceeded by approximately $60,000,000 those made during the corresponding period of last year. Of the total amount authorized $166,000,000 was actually expended for capital improvements during the first three months of the year, or slightly less than for the corresponding period in 1925. Of the $822,000,000 so far authorized, $467,000,000 represents unexpended authorizations carried over from 1925, while the remainder represents additional authorizations made during the first three months of the current year. On the basis of these figures the bureau estimates that the total capital expenditures for the year 1926 will run between $750,000,000 and $800,000,000.

Capital expenditures for roadway and structures for the first three months of this year amounted to $90,800,000, an increase of $19,200,000 compared with the first three months of last year. Of this total $39,900,000 went for additional tracks, heavier rail and more ballast, an increase of $11,400,000 compared with the corresponding period last year. During the first three months this year capital expenditures for equipment amounted to $74,900,000, a decrease of $22,800,000 compared with similar expenditures for the first three months of last year.

Train Wrecker Convicted.—James J. Moore, a helper on an electric locomotive of the Long Island Railroad who turned a switch under a passenger train at Long Island City, N. Y., on July 30, 1924, was sentenced in the Queens County Court on May 5, to 60 days' imprisonment in the workhouse. One passenger was killed in the derailment that resulted from the turning of the switch under the train. A signalman is also involved.

A Double-Header Erection Rig

Two Unusual Erection Schemes

Burlington Bridge Forces Overcome Limitations of Derrick Equipment in an Original Manner

By F. H. CRAMER

Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

IN BUILDING two steel viaducts on the 17-mile cut-off constructed by the Burlington on its Beardstown division north of Beardstown, Ill., last year, two original schemes of erection were developed which are of interest as illustrating what may be done through the exercise of ingenuity to overcome the limitations of erection equipment available. One of these involved the tandem arrangement of two machines, while the other involved an unusual rolling operation. The successful employment of these two schemes resulted in a marked saving in erection costs and successfully avoided the use of an erection program which would have resulted in a considerable delay in the completion of the line.

The two structures in question comprise the crossing of streams known as Sugar creek and Harris branch, located about 4 miles and 9 miles, respectively, from the south end of the line. The two structures are similar in design, embracing the usual arrangement of steel towers and deck plate girder spans, the tower spans being 30 ft. long and the clear spans in most cases 59 ft. long. The Sugar Creek viaduct has a total length of 591 ft. 2 in., with a maximum height of 74 ft. It is made up of five 30-ft. tower spans, five 59-ft. clear spans and one 90-ft. span over the channel of the stream. All of the girder spans are covered with a reinforced concrete ballasted deck. At the south end where the natural ground rises to the track level there is a two-span approach of reinforced concrete trestle construction composed of 14-ft. reinforced concrete slabs on reinforced concrete pile bents. At the north end, where the structure terminates in the end of a 60-ft. embankment, the end of the last girder is supported on a pier of creosoted piles with two approach spans of creosoted pile trestle.

The Harris Branch bridge is 484½ ft. long and has a maximum height of 90 ft. It consists of three 30-ft. tower spans and four 59-ft., one 49-ft. and two 40-ft. clear spans, all consisting of deck plate girders with concrete ballasted decks. In addition to the three towers, the supports for the girders include two creosoted wood pile piers and three concrete piers. There is a 14-ft. reinforced concrete trestle span at the south end and one 14-ft. creosoted pile timber trestle span at the north end. Both bridges are on a 0.25 per cent grade rising northward, the Sugar Creek bridge being on tangent and the Harris Branch bridge on a one-degree curve, superelevation being provided for in the ballast.

In both structures the viaduct towers are supported on cylindrical concrete pedestals, of which all those in the Harris Branch bridge are founded on rock, while in the Sugar Creek bridge four pedestals are on rock foundation and all of the remaining ones on pile foundations.

As the country through which the new line was built is rough and virtually inaccessible insofar as the hauling of heavy materials is concerned, the most practical and economical program for track laying was to start at the south end of the line and carry on the work progressively to the north. This meant that the track laying had to be stopped at the south end of the Sugar Creek bridge until this bridge could be completed. It also made it highly desirable that the erection of this bridge proceed northward from the end of track at the south approach.

The piers and abutments were built under contract, but it was decided to carry on the erection with company forces, using a bridge derrick car of 40 tons capacity with a 45-ft. boom and a locomotive crane of 50 tons capacity with a 60-ft. boom. The erection was started from the south end and the two 14-ft. concrete slabs were set first. Next the south bent of the south tower, or Tower No. 1, was erected. This involved a reach of 59 ft. 2 in., but as the columns were only 29 ft. long and not of great weight this operation was carried out without any particular difficulties. Following the completion of this bent the first 59-ft. span

was set into place, after which the north bent of the tower and the 30-ft. tower span were placed. The two girders of each span with cross-bracing and top and bottom lateral systems were assembled and riveted up on cars and then hauled out to the bridge site. The 40-ton bridge derrick was used to set the girder spans, while the 50-ton locomotive crane with the 60-ft. boom was used to set the towers.

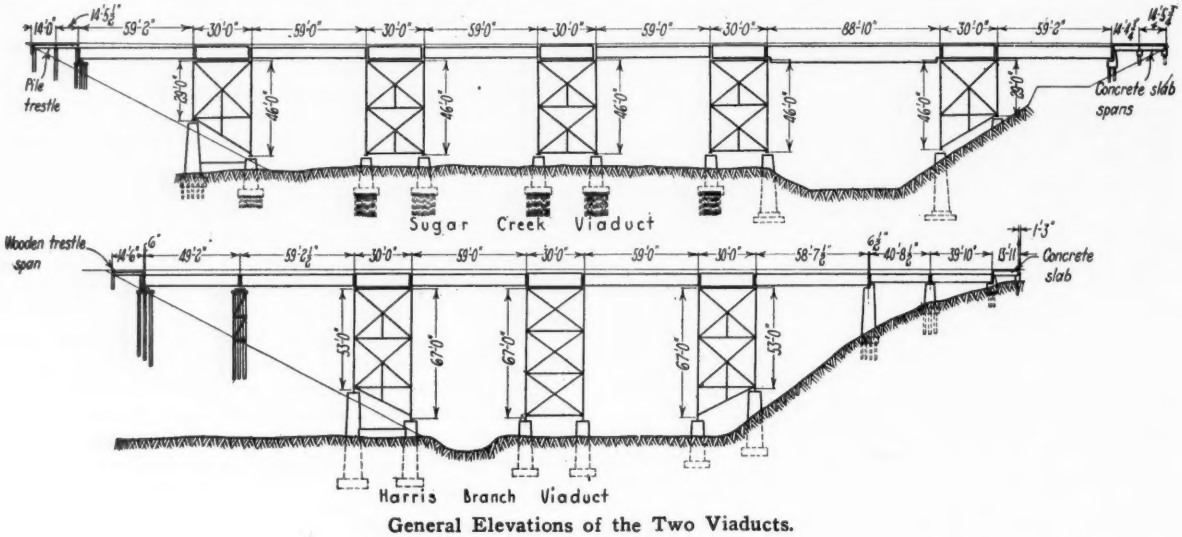
Long Channel Span Introduced Complications

The next problem was to erect the 90-ft. channel span, which imposed the requirement that the tower at the north side of the channel be erected first. But this could not be done with the erection equipment available, as neither unit had a sufficient boom reach to set members of this tower from a position on the top of Tower No. 1 on the south side of the channel.

Several methods of overcoming this predicament were given considerable thought. One was to construct high falsework over the channel and move the derrick car out on this to erect Tower No. 2 and then use two derricks to set the 90-ft. span. Another one was to set up a stiff-leg derrick with a long boom on the ground in the river bottom to erect the bents of Tower No. 2 and then set each 90-ft. girder with a large derrick having a long boom. A third was to start from the south end and erect the slabs, Tower No. 1 and the first 59-ft. and 30-ft. spans, and then come in from the north and erect the north end of the bridge to the north side of the channel, after which the 90-ft. girder span could be set by derrick cars on the adjoining towers. However, before this could be accomplished it would have been necessary to lay track for 10 miles from the north and also to erect the Harris Branch viaduct. This would mean that the Sugar Creek bridge would be erected last and clearly pointed to a definite delay in the completion of the line.

The plan adopted is one which the writer believes has never been undertaken before in exactly the same form. Although it required several days longer than would have been necessary if a locomotive crane or derrick car of sufficient capacity and boom reach had been available, it proved thoroughly practical and avoided the complications introduced by the other plans considered. It called for the erection of falsework in the creek channel and to the north pedestals of Tower No. 2. The first object of this falsework was to serve as a temporary support for the erection of Tower No. 2 in a position immediately adjacent to Tower No. 1. This falsework was high enough so that the tops of the columns on Tower No. 2 were at a sufficient height above the completed part of the viaduct to permit the 90-ft. girders to be run out on the track and connected to the bearings on the tops of the tower columns. The second purpose of this falsework was to serve as a runway on which Tower No. 2 could be rolled out into position over the pedestals, carrying with it the 90-ft. span while supported on the south columns.

Releasing the Cars On Which the 90-Ft. Girder Span Was Moved Out On the Bridge.



General Elevations of the Two Viaducts.

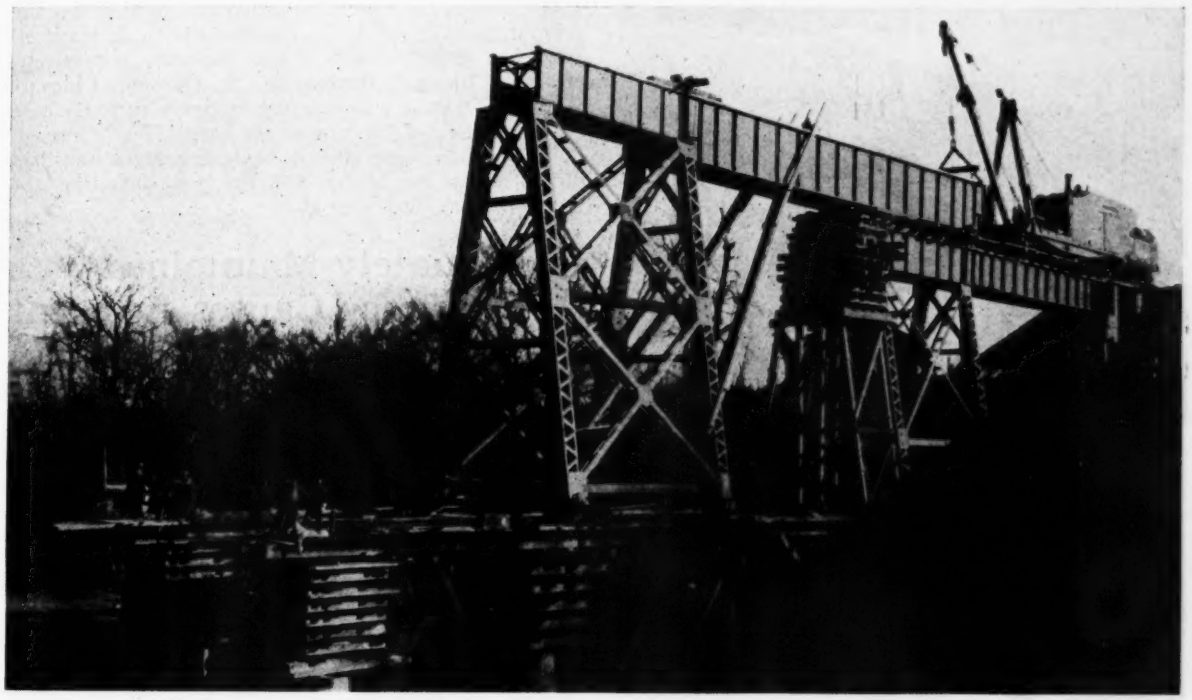
Tower Columns Were Set on Rail Dollies

This falsework consisted of seven pile bents, spaced 13½ ft. center to center, capped and well braced and carrying a deck of stringers to serve as the support for four lines of steel rails arranged in pairs 12 in. apart directly in line with the bottoms of the columns on the upstream and downstream sides of Tower No. 2.

In addition, this falsework tower served as a support for a two-bent wooden tower built adjacent to steel Tower No. 1, the purpose of which will be explained later.

The bents of Tower No. 2 were erected with their column bases resting on rail dollies standing on the rails of the runway, there being two dollies under each post. After the tower was erected complete with its 30-ft. girder span the 90-ft. girder span was rolled out on two cars, blocked up to release the cars and then lowered by jacks until the outer end rested on and was securely bolted in position to the columns of Tower No. 2, while the other end was supported on dollies resting on the track.

The tower and spans were then ready to be moved north about 70 ft. to final position. A 30-hp. double-drum steam hoisting engine was blocked securely in place a short distance north of the piers to pull the 90-ft. span and the tower into position. Lines from the drum of this hoisting engine were secured to the lower ends of the steel columns of the tower. When these preliminaries had been completed the derrick car was placed on the south end of the 90-ft. span to hold this end in suspension while the tower and girders were being pulled out. Several stops were made during the course of the movement so that the derrick car could move ahead. The total movement occupied two working days of 10 hours each. When final position was reached care was taken to see that the anchor holes in each of the tower columns were accurately centered over the anchor bolts.



Rolling the Tower and Girder Span into Place.

How the Tower and Girders Were Lowered

To lower the tower and girder span a 25-ton jack was placed under each end of each bottom horizontal strut of the tower as close to the columns as possible, thus leaving the bottoms of the columns free to come to bearing on the pedestals. A 50-ton jack was also placed under the south end of each of the 90-ft. girders, these jacks being supported on blocking piled on top of the timber tower erected adjacent to steel Tower No. 1 as previously explained.

Two sets of blocking were used to lower the trestle tower. Short blocks were placed directly on top of the concrete piers and long blocks were cribbed around the piers, being supported by frame bents placed directly on the footings of the piers. The short blocking on the concrete piers was used to support the tower while the jacks were reset and the long blocking around the piers removed. During the lowering process the blocking directly on the concrete piers was removed, but at no time was there more than a two-inch space between the steel and the blocking. In lowering the south end of the 90-ft. girder span a derrick was used to raise the span sufficiently to release the jacks for resetting and to remove the blocks.

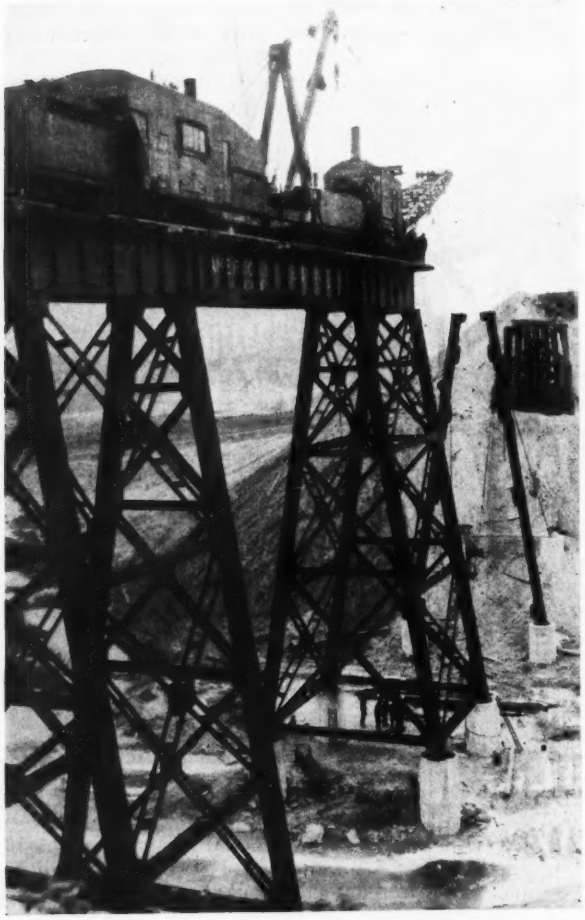
The 90-ft. girder span weighs 67 tons, viaduct tower No. 2 weighs 42 tons, while the 30-ft. span weighs 10 tons, making a total weight of 119 tons that had to be rolled and lowered. This method of rolling out and lowering worked out very successfully and at no time was it necessary to shift the tower when lowering it over the anchor bolts.

After this part of the viaduct was in final position the erection of the remaining portions of the structure was completed progressively to the north end by means of a derrick car and the locomotive crane. However, in carrying out this work as well as in the erection of the Harris Branch viaduct a perplexing problem was experienced in developing a method of erecting the first bent of each tower with the locomotive crane on the top of the tower previously erected because the distance center to center of the nearest bents of the two towers is 59 ft. Although the locomotive crane employed on this work had a 60-ft. boom, the heel of the boom is some distance behind the forward wheels of the crane. In consequence it was impossible to reach the distance to the position of the first

bent of each new tower with this boom in the lowest possible position, even with the locomotive crane moved forward to the very end of the tower girder span previously erected. Furthermore, with the boom in a nearly horizontal position the body of the crane did not offer a sufficient factor of safety against forward overturning when lifting the tower columns, which weighed about 10 tons.

One Crane Used to Help the Other

To meet this situation a unique plan of erection was adopted which involved the use of both the locomotive crane and the bridge derrick car in a tandem formation. The first step under this plan was to haul out the columns for the bent and set them on the ground a short distance from the erected tower with the upper end leaning against this tower and securely held in position by ropes. After this was done the 60-ft. boom of the locomotive crane was lowered for maximum reach and chained securely to the car body on each side so that there would be no side motion of the boom. Then the derrick car was brought up directly behind the locomotive crane and the auxiliary fall line of the derrick car was fastened to the outer end of the 60-ft. boom of the locomotive crane. In other words, this auxiliary fall line of the derrick car acted as an auxiliary boom line for the crane.



Auxiliary Line from the Derrick Car Served as an Extra Boom Line for the Locomotive Crane.

The derrick and crane were then moved out to a point where the end of the crane boom was in convenient position for picking up the column from the place where it had been previously set, after which the two machines were moved out until the front wheels of the locomotive crane were on the extreme edge of the 30-ft. span of the erected tower. In this position the forward end of the crane was supported on a wooden frame bent placed directly under the car body with the lower end placed on top of the steel columns and securely wedged. Then the column was raised and the lower end swung over the anchor bolts while the upper end was guided by three sets of hand tackles snubbed to suitable anchorages so that they would serve as adjustable guy lines to hold the columns until all the sway bracing was erected and the 59-ft. span had been set in position. This operation was repeated for the columns of the south bent of each tower of the Harris Branch bridge and for three towers of the Sugar Creek bridge and proved entirely successful.

The two bridges were designed and built under the general direction of A. W. Newton and G. A. Haggander, chief engineer and bridge engineer, respectively, of the Chicago, Burlington & Quincy, Chicago. William Thomas was resident engineer in immediate charge of the construction of the entire 17-mile cut-off. R. E. Sheehan, supervisor of bridges, eastern lines had direct charge of bridge construction including the erection work described above.

Inadequately Maintained Track Causes Accident

ON NOVEMBER 1, 1925, a westbound freight train, consisting of seven cars and a caboose, was derailed on the New York, Chicago & St. Louis near Erie, Pa., resulting in the death of the engineman and the injury of the fireman. The derailment, in which the locomotive and five cars were overturned, occurred at 11:45 p. m. on a three-degree curve, while the train was traveling at a speed of not more than 40 miles per hour, the limiting speed for freight trains.

The track for some distance on each side of the point of derailment was laid with 90-lb. rails, 33 ft. in length, with an average of about 20 oak and pine ties to the rail-length, single spiked and ballasted with cinders. Some of the ties were plated, but no rail anchors were used. Inspection of the track after the accident developed that the super-elevation and gage of the curve on which the derailment occurred had been well maintained, and furthermore that the curve preceding the point of derailment was in good alinement. It did, however, disclose that on this curve, the single spiking had been considerably weakened by numerous broken, corroded and loose spikes and that tie plates had cut into the ties to a depth of ½ in. in many cases. At several points there were distinct evidences of track pumping, the ballast having worked out from under the ends and sides of the ties to quite an extent, showing a wet, spongy condition. At several other points the shoulder of the road bed had also been washed away, this condition being attributed to the unusually heavy rainfall which had occurred for some days prior to the accident.

Coupling these conditions with the favorable testimony in regard to the condition of the locomotive, it was the conclusion of the Bureau of Safety that the accident was believed to have been due to failure to maintain the track in proper condition for the operation of trains at the maximum rate of speed allowed.

Labor and Its Supervision*

The Handling of Men, Based on a Study of Human Nature, Fosters Efficiency and Contentment in Forces

By C. E. JOHNSTON
Vice-President and General Manager, Kansas City Southern, Kansas City, Mo.

THE man who says he never makes a mistake is either a liar or a loafer. Human nature is fundamentally imperfect and because of this fact mistakes are made wherever human nature is employed. In every business, be it that of manufacturing calico dresses, selling ice cream cones, running a peanut stand or keeping books, errors of various kinds are constantly being made. Nor does recognition of the fact that "to err is human," obviate the necessity for enduring the commitments of error.

Mistakes are expensive. They waste time, not only that involved in their perpetration but also that necessary for their correction, both of which expenditures would be saved if the mistakes had not been made. Errors cost customers, money, time, goods, material, men or jobs, depending upon the nature of the business and the tolerance of the one on whom the brunt of the error falls. In any event the sequence of errors is inescapable.

Almost no price is too high to pay for increased accuracy. Today's tendency in every line is for accelerated speed. Speed is profitable if coupled with accuracy, but it is a nihilist if married to inaccuracy. This simple fact should mean much to maintenance of way supervisors, since it should cause them to consider error elimination before endeavoring to speed up production. Too often production takes precedence over efficiency and safety.

How Do We Select Our Men?

The item of labor is one of our largest items of cost. How do we select our men and what tests are they given to determine their physical, mental and moral strength or weakness? We must agree without hesitation that men vary in these capacities to the same or a greater degree than materials vary in strength. What will be the result, figuratively speaking, if a rotten tie or several rotten ties are thrown together under a panel of track? The answer is obvious. What will be the result of the use of bad cement in a bridge pier, and so on? Apply this to your organization—what is the result of employing men physically, mentally or morally unfit to withstand the load or strain required of them? You men well know the answer. It's retrogression—disintegration—stagnation. Its tendencies are disorganization and resultant losses in every way. There is no way in which it may be justified.

Why continue making these mistakes? Why not take hold of the situation insofar as you are concerned and straighten it out? It may be said that our higher officers are not alive to the situation and are not active in establishing or enforcing a defined policy with respect to this matter. No doubt there is a measure of truth in such a statement, but did it ever occur to you that many higher officers are busily engaged in their many other duties and depend largely upon us to originate ideas of this kind? From my own experience I know that practical ideas with respect to the improvement of conditions of any nature are generally welcomed by our higher officers.

I have spent about 20 years with the Kansas City Southern and the past 15 years in the capacity of chief engineer, general manager, and vice-president and general manager respectively. During the past 15 years I have had general charge of the maintenance department. I have been a student of the economies of railroad labor as reflected in maintenance costs. I well know of the great variation in the character of labor in the various communities and realize that in many ways we cannot apply a general rule or practice. There are certain fundamentals, however, that we must acknowledge, and due consideration that we must give in all applications.

All labor is human and has the feelings and inclinations creditable to man. Therefore it is for us to have and to evidence a disposition to treat labor with kindness and compassion. Human conduct is determined by a great variety of factors—emotion, temperament, will, knowledge, attention, memory, perception, reasoning, etc. Some or all of these are combined into that function which is called intelligence. We must fully appreciate the true situation with respect to the average intellectual capacity of our labor. By this I refer principally to common labor.

In a man's relations with his subordinates, it is essential that he keep constantly in mind that it is not a question of stature or age, but of mentality that determines an individual's conduct. The fundamental condition of winning a man to one's way of thinking is to convert him to one's friendliness and interest in his welfare. Lower intelligence will invariably and inevitably seek and follow the advice of higher intelligence so long as it has confidence in the individuals having the higher intelligence. It is the man whose activities show that he cares for the welfare and the happines of those of less intelligence who has their confidence, their support and their obedience.

We must admit the weakness in past methods of employment and perhaps our present methods will not bear close scrutiny. May I suggest three ways to improve the character of the personnel—employ a better class of men; educate those kept; and discharge the vicious and incompetent. If there is any difference in relative importance of these measures, I am of the opinion that we should lay emphasis on the last.

*From an address presented before the Maintenance of Way Club of Chicago on May 19.

Railroad employment is to a marked degree regarded as a protected service. Once a man's name gets on the payroll he is hedged about by constant and numerous artificial restraints, as a permanent fixture. In gardening it is not sufficient that the soil be good and well sustained by fertilizer, and the seed the best. The resulting crop depends largely upon cultivation and weeding. Similarly in railroad service, the careful selection of men, their education, and, above all, the systematic and unwearied weeding are essential. Know your men, and eliminate at once those who from whatever cause are palpable misfits.

Railroads should adopt schedules of their labor requirements; the number of officers authorized to receive applications and employ men should be reduced to a minimum, and the employment records kept by these officers should be systematically inspected at reasonably short intervals by some superior authority, or duplicates sent to some central office where they may be examined and checked.

Systematic Employment Methods

So far as possible, men in maintenance work should be employed from those living along the line of road, and the local foreman or agent should be the principal recruiting officer. Their moral character, physical fitness, mental capacity and education and past record should be rigidly examined. Only the best and most suitable should be employed.

Perhaps if I should outline briefly some of our objectives on the Kansas City Southern you may better understand our ideas of improvement in the employment, education and care of employes in the maintenance department. Our organization is departmental. The maintenance of way and engineering departments are in charge of the chief engineer, who reports direct to the vice-president and general manager. Our division engineers have charge of maintenance of way work and report direct to the chief engineer and our roadmasters report to the division engineers. We undertake to educate engineers in maintenance work before promoting them to the position of division engineer. One of our requirements of a division engineer is that he must have had at least two years experience as a roadmaster.

Organize Maintenance of Way Association

Particularly since the end of federal control we have intensely studied our labor problem, not only in the maintenance of way department but in other departments. We have organized and have functioning to the fullest extent a separate personnel department in charge of a superintendent of personnel who reports to the vice-president and general manager. Through this organization we are able to accomplish many important things, such as the maintenance of an accurate personal record, the close supervision of employment, the supervision of welfare and safety work, group insurance, a connection between employes and the hospital association, and supervised recreation. We are strong believers of "knowing your men" and in this respect have arranged for monthly meetings and for our maintenance of way foremen to attend them. With this of course was a program designed to hold their interest and to draw out discussion. You would enjoy seeing some of our section foremen perform at these meetings which we still hold and which appear to be getting better all the time.

The chief engineer is permanent chairman of these meetings and makes it his business to attend. With him go many others such as the office engineer, bridge engineer, signal engineer, architect, division engineers, assistant engineers, roadmasters, inspectors, superintendent of telegraph, superintendent of personnel, personnel supervisors and the supervisor of safety. Officers in other departments are invited to attend when convenient and we usually have some there.

The foremen are urged to participate in the discussion of the various papers, as well as in the preparation of papers. Stenographic notes are taken of all discussions which are shown verbatim in a monthly maintenance of way bulletin issued in the interest of employes in that department. Foremen are allowed full time for the days spent in attending these meetings and are also given their meals while away from home.

We get wonderful results from these meetings and we find that they broaden the viewpoint of these men and their acquaintanceship to such an extent that there appears to be no time for waving a red flag. Also, perhaps you may recall the old saying, "Like father, like son"—"Like foreman, like men." We have found by experience that once the foreman is "right" one need not fear the mental attitude of the men under him after a sufficient time has elapsed to develop such a condition. This, I think, is the one great benefit we derive from our organized effort to bring these men together.

I say organized because it is so. We think it must be so. I mean by this, that we believe it is of sufficient importance to make it our business to keep it alive and functioning, and we are spending our time and money to that end. There appears to be no half-way ground and we do not propose to have that mistake chalked up against us.

We Should be Willing to Fight for Our Foremen

Another important consideration is the treatment of our maintenance of way foremen. We also make this our business and are spending time and money at it simply because it's worth it and we get a large return in more ways than one. I am assuming that you have the same wholesome respect for your foremen that we have down our way. I know you will agree that maintenance foremen as a rule have other men backed off the board when it comes to downright loyalty and service. Why then should we not be willing to fight for them at every turn in the road?

It is essential to our success, if we are to succed in this game of railroading, to have the full support of our men. We cannot hope to receive the full measure of success in our undertakings unless the men under us render assistance. I say assistance and I mean, men who will go the limit for us in anything we start.

Then why, in all fairness to these men who have confidence in us and who are more than willing to give their all in service, should we not give more consideration for those things that mean so much to them as a rule, and so little in comparison for us to help them get. Most of these men are satisfied and contented to have a living wage and a comfortable home where they can properly rear their families, educate their children and be duly protected against misfortune or old age. On the Kansas City Southern we are striving very hard to attain this goal. In almost every instance we furnish a comfortable section house and undertake to so maintain it; we have placed in effect differential rates for the purpose of balancing the differences between the various classes of work. For instance, we have as a basic rate that paid on an outlying section with living quarters furnished. We pay more for outlying sections with no living quarters in order to help compensate the foreman for the rent necessary for him to pay. We also pay more for yard sections, due to the higher class of work required. In other words, a foreman in a large yard, without living quarters furnished, is paid the maximum

rate. We undertake to maintain these same principles with respect to our bridge and building and other maintenance foremen.

We are not half through with this process of betterment nor have we worked out all of our thoughts. As a matter of fact, we have just started, but the start made to date seems to prove the worth of the struggle. We are at present planning the construction of an outfit for a pile driver crew. This will consist of seven cars as follows: a foreman's car, with toilet, bath, steam heat and electric lights; a kitchen and dining car, with electric lights and steam heat; two sleeping cars with steam heat and electric lights; a recreation car with seats and tables in one end and toilets and shower baths in the other end, and with steam heat, electric lights and hot water; a tool and supply car and a water car. This, when completed, will be the first outfit of this kind on our railroad. The cars will have steel underframes and otherwise be made strong and equal to the service required of them in making prompt and safe trips over the road. The lighting system will be a Delco plant; the steam heat will be provided by an Arcola furnace and sanitation will be taken care of in a septic tank arrangement. This is going pretty strong, but why not? Do you not think we will get it back with interest in the service rendered by this gang? At any rate we propose to work it out and observe the results.

Maintain Uniform Section Force

Perhaps another item worth mentioning in connection with our labor situation is our effort to stabilize employment. For the past few years we have undertaken to maintain uniform section, bridge and building forces throughout the year. There may be exceptions to this rule, but generally it is the practice, and you would be surprised, if you are not familiar with the results, to see how much work a section foreman and three men can do in the summer season when his heaviest work takes place and also be surprised at how much necessary work there is for a foreman and three men during the winter months when the work is supposed to be slack. In connection with our uniform section force, we undertake to maintain a foreman and three men the year around. The force above that number on regular section work is regarded as "extra." Much has been said in the past about the additional cost of work due to inexperienced track labor employed seasonally. We have found such claims to be true and that as a rule three experienced men will do as much or more work perhaps than five or six inexperienced men. This goes far to offset what may seem to be unnecessary labor expense during the winter months.

Another very attractive feature of our employment is our group insurance for the protection of the families of employes. The company pays a part and the employe the balance. His part may be carried under our system without overburden with the result he has protection in an old line company so long as he remains in our employ. Only recently we lost one of our section foremen whose widow received a check for $2,000 to cover his insurance within a week or ten days after his death.

I have enumerated many of our conditions with respect to our labor and its supervision. I do not suppose you care to hear more. Your problems may be somewhat different but you have the same human element entering into it. That is something we cannot escape, and as supervisors we must not only think ourselves but must carry much of the burden of doing the other fellow's thinking. In my opinion it is the supervisor who is the most thoughtful and sympathetic with his men who accomplishes the most. I cannot bear down too strongly with respect to our foremen. They are the backbone of our good or bad labor conditions, as the case may be, and therein lies our opportunity.

Keep The Tool House in an Orderly Condition*

By John Sour
Section Foreman, Kansas City Southern, Neosho, Mo.

THE CONDITION of the section tool house and the manner in which the track material stored in and around the tool house is piled and cared for is a fairly good indication whether a foreman is trying to prevent waste. To keep a tool house properly there should be a place for everything, and everything should be kept in its place. In the first place, the tool house should be kept clean and free from rubbish. Broken or worn-out tools should not be allowed to accumulate, but should be cleaned up and turned in to the supply cars each month. The tool house stock should be held down according to the number of men employed.

The tool house should be arranged so as to keep the tools and materials separated, also to keep the different kinds of tools separated so that they can be placed readily on the hand or motor car when starting out in the morning.

Racks should be built on one side of the house to take care of all kinds of bars, wrenches, and spike mauls, while places should be built on the opposite side to take care of shovels and other tools. The same kind of arrangements should be made with small car house supplies such as bolts, washers, nails and switch lamp fixtures. Track bolts and spikes should be kept in kegs, the bolts on one side and the spikes on the other. With this arrangement car house supplies can be checked up by any one in a very few minutes and foremen will always know what they have and where to find it.

Separate piles should be made of the different kinds of material and also, the new, second-hand and scrap material of each kind should be separated in order that material on hand can be checked out readily at any time without having to sort it. In so piling the material, whether new, second-hand or scrap care should be taken to see that the material is piled in such a manner and in such a place that it will not deteriorate any more than is absolutely necessary and will not get lost, as every scrap material has a value. Then, too, it should be piled in such a way that it will not be difficult to get when it is to be used, as waste of time is just about as important as waste of material.

If foremen would take as much interest in the care of the company's tools and material as they do in the care of their own, there would probably be different handling given material from what is actually given in some cases. I believe that most of the foremen are beginning to realize this, since so much has been said about the waste of material.

*Abstracted from a paper entitled, "Keeping the Section Tool House and Maintenance of Way Stock in Orderly Condition," presented before the Kansas City Southern Maintenance of Way Association.

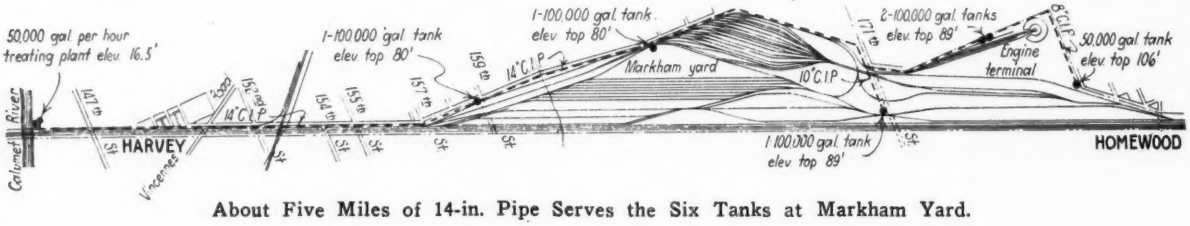
Commercial Stocks of Coal.—An inventory of coal stocks as of April 1, shows 40,000,000 tons of bituminous coal in the hands of consumers, according to the Bureau of Mines, Department of Commerce. This is slightly lower than at a corresponding period last year, but about midway between the stocks of June and September, 1925.

Illinois Central Builds an Automatic Water Supply Station

Facilities Supplying Markham Yard and Engine Terminal Demonstrate Practicability and Economy of New Methods

IN connection with the construction of its new Markham yard on the outskirts of Chicago, the Illinois Central has recently installed a water station at Harvey, Ill., which, though similar in many respects to some of its other plants, differs in the degree of its completeness and the fact that it is electrically operated and automatically controlled throughout. The installation is particularly unique in that the control of water levels at six scattered locations and at different elevations is carried out effectively from one central pumping station. The facilities which are designed to both pump and treat the water supply, consist of four main pumping units, a 50,000-gal. per hour continuous lime and soda ash type softening plant, two sand filters and a clear water well of 50,000 gal. capacity.

This plant was constructed to serve the new Markham freight terminal of the Illinois Central, located between Harvey, Ill., and Homewood, which is one of the largest in the country, and in order to do so is supplemented by six 100,000-gal. water storage tanks, nearly five miles of 14-in. cast iron pipe, and several miles of 8-in., 10-in., and 12-in. pipe. In order to secure the desired distribution of the water supply, four of the storage tanks are located throughout the yard, which is about three miles long, while two of them are at the engine terminal, where there is the largest demand for water. All of the tanks in the water storage system are American Railway Engineering Association standard creosoted wood tanks, five with a capacity of 100,000 gal., and one with a capacity of 50,000 gal. The treating tank is a 500,000-gal. cylindrical steel tank, constructed by the Chicago Bridge & Iron Works, Chicago. Water from the six storage tanks is supplied to locomotives through eleven 12-in. Poage water columns, and by suitable outlets to the facilities at the engine terminal, which has adequate capacity for handling 100 locomotives a day, in addition to facilities for making general repairs to a large number annually. The present daily consumption of all facilities at the yard and terminal is 800,000 gal., while it is expected that this will reach 1,000,000 gal. when all of the facilities are used to capacity.



About Five Miles of 14-in. Pipe Serves the Six Tanks at Markham Yard.

Electrical and Automatic Features

The most interesting features of the installation at Harvey are its electric operation and the method of automatic control which illustrate the flexibility of electric power for railroad pumping service and the possibilities and advantages of automatic control. Thus, through this system of operation and control, water is pumped into the treating tank, treated, and distributed to the six storage tanks according to their requirements, all without manual attention. The only attention required at the pumping and treating plant, other than oiling and occasional inspection of the electrical equipment, is that of one man to prepare periodically the proper proportion and amount of lime and soda ash for the treating solution and to wash the filters.

The main pumping units at the plant are four Fairbanks-Morse, single stage, horizontal split case, enclosed impeller, bronze-fitted, centrifugal pumps which can be operated separately or together, depending upon the demand for water. Two of these pumps are for pumping raw water from the river intake to the treating tank while the other two pumps are used on the distribution line. Each of the two intake pumps is driven by a 25-hp. Fairbanks-Morse, slip ring motor, and each of the treated water pumping units, distributing the water to the storage tanks, is driven by a 40-hp. Fairbanks-Morse motor of the same type. These motors are all 440-volt, 60-cycle, 3-phase, and have a temperature rating of 40 deg. F. While the automatic control is arranged for the operation of all of these motors, cut-out switches have been provided on the station power board to cut out the automatic operation of any one or all of the pumps, and a manual push button control system has been installed to regulate the operation of all of the units cut out.

Float Switches Control Operation

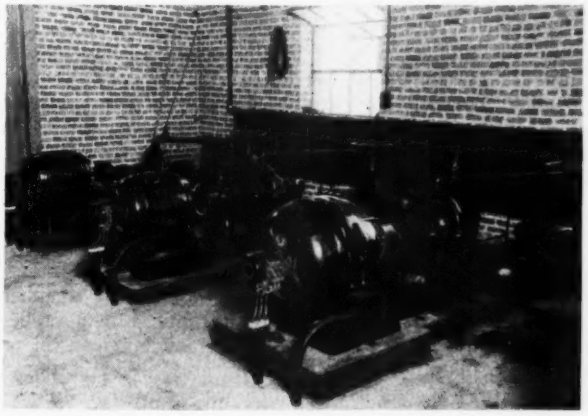
The automatic control of the pumping units is effected by a series of electrically connected float switches which are operated by the rise and fall of the water in the clear well and the storage tanks. This system was manufactured by the Sundh Electric Co., Newark, N. J. In connection with the raw water supply, the float regulation is designed to start and stop one of the intake pumping units with a drop or rise of two feet in the clear water well, and to cut in the other unit in case a further drop of one foot occurs. On the resumption of the three-foot water level, the auxiliary unit is cut out and the main unit continues to operate until the capacity of the clear well is reached. As a means of equalizing the duty of the pumping units over a period of time, the control is so arranged by means of a transfer switch that either of the units can be cut in as the main pump, the other acting as the helper pump.

For the purpose of controlling automatically the sup-

ply to the storage tanks throughout the yard and at the terminal, and to simplify the electric control circuits, the tanks have been arranged in three groups with the following high water elevation for each group: 80 ft., 89 ft., and 106 ft. As in the case of the clear well, the elevation of the water in the tanks in these groups is governed by float switches which control the operation of the two storage water pumping units. The float control is so designed that when the water level drops six feet in any one of these tank groups, one of the

The Pumping and Treating Plant at Harvey, Ill.

two storage supply pumps will start, and if the water continues to drop to or below an eight-foot level, the other pump will start and both pumps will then continue to operate until that tank group as well as the other tanks are full of water, at which time the pumps stop automatically. The control arrangement provides also that either or both of these pumps will stop when an emergency float switch recedes six feet below the high water level in the clear well. This prevents these pumps from burning out if the water should drop below a safe operating level. In order to prevent the flow of water from a tank of higher elevation to one at a lower elevation, check valves have been installed between each of the groups, and overflow of any of the lower tanks,



The Intake and Distribution Pumps are Located Across One End of the Equipment Room.

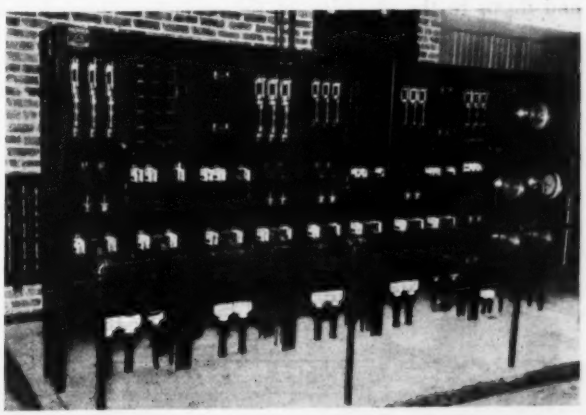
while water is being pumped to the higher tanks, is prevented by a float valve installed in the intake line of each tank.

In the float control of the water supply to the storage tanks there are three sets of float switches, one at each tank group. These are installed in each case in a water-proof housing on the roof of the tank. According to the level governed, these switches are termed "high level" and "low level." All of the high level switches are connected in parallel as are also the low level switches, these circuits being carried back to the main control board in the pumping station as two separate float switch control circuits. As in the case of the raw water pumps, a transfer switch is so connected into the circuit that it is possible to alternate the two pumps as main pump and helper pump. Both of these pumps are equipped with automatic air vents to allow prompt priming when operated automatically.

Operating in conjunction with the two 25-hp. motors driving the raw water pumps, there is a 3-hp. motor driving an agitator in the chemical mixing tank and a 1½-hp. motor operating a small triplex chemical feed pump, both of which are so connected into the circuit that they start and stop simultaneously with the larger intake pumps. This is accomplished by suitably interlocking two small automatic starters controlling the agitator and chemical pump motors so that these motors start automatically when either raw water pump is started and continue to operate until both of these pumps are stopped. When it is desired to mix a batch of chemicals, independent operation of the agitator motor is provided for by a knife switch on the control board.

The Control Board and Power Supply

The control for each motor includes a three-pole, fused, main line knife switch; an automatic starter consisting of a three-pole primary contactor electrically interlocked with two-pole secondary contactors equipped with time limit adjustable dash-pots to provide correct time of



All Automatic and Push Button Operations are Master-Controlled from One Power Board.

acceleration; two inverse time limit overload relays; a dead phase relay, and a single-pole, double-throw, knife switch. The latter, previously referred to as a cut-out switch, in one position puts the automatic starter under the control of the float switch, in the open position makes the starter inoperative and in the reverse position controls the starter independently of the float switch. In addition to the starting and control apparatus, a panel is provided carrying an eight-day clock, two vacuum gages on the suction lines and two combination indicating and recording gages on the discharge line.

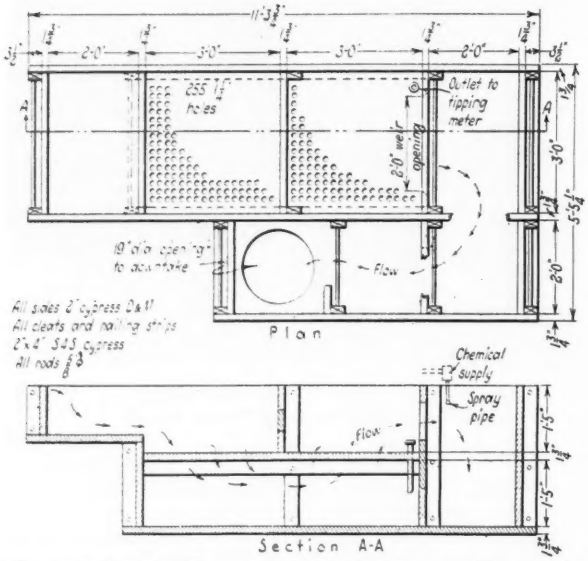
The power supply for the operation of the motors and the electric lighting system is secured from the company's 2,300-volt miscellaneous power line and is stepped down to the voltage desired through a bank of transformers located outside the plant. From the transformers, the power is carried to a master switch box in

the building and then to the control board, from whence it is connected to the motors.

The water softener at Harvey, which is a continuous system of the lime and soda ash type, is located along the bank of the south branch of the Calumet river, from which source the water supply is obtained. The most interesting feature of this installation is the system of proportioning and applying the chemical solution and the method of stilling the water in connection with this system. In operation the raw water from the river enters a small concrete sump from which two suction lines of 8-in. pipe lead direct to the two motor-driven pumping units, each of which has a capacity of 750 gal. per min., against a head of 75 ft. Passing through the pumps, the water is elevated through a 10-in. line to the top of the treating and settling tank, which is a cylindrical tank of 500,000 gal. capacity.

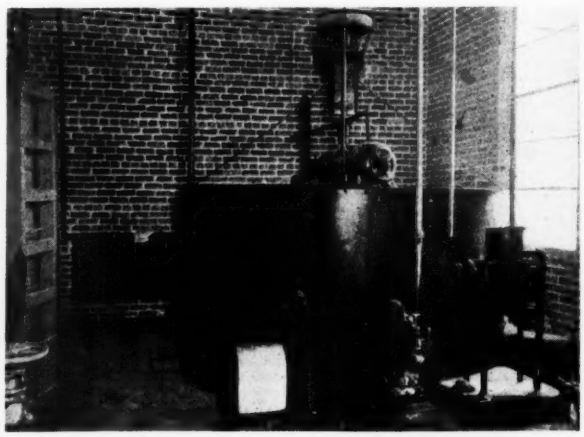
Special Features in Proportioning Chemicals

The principal features in connection with this tank are the 10-ft. center downcomer or reaction chamber which extends from the top of the tank to within three feet of the bottom, and the stilling and chemical mixing box which is located in the head-house on top of the tank. The mixing box is 11 ft. 3¾ in. long and is two sections wide, the first section being 3 ft. wide and the second section, which is at a lower elevation, 2 ft. wide. This box is located directly over the tank downcomer and raw water is admitted at one end, from which it drops through a horizontal plate containing two hundred and fifty-five 1¼ in. holes. The water then passes through a vertical opening and rises through another horizontal perforated plate, from whence it flows over a weir and drops to the elevation of the second section of the



Plan and Section Through the Mixing Box on Top of the Treating Tank.

mixing box. The whole purpose of the horizontal perforated plates and the course of the water up to the weir is to quiet the surface of the water and provide an upward flow at the back of the weir which will prevent debris or foreign material from lodging on its crest. Another important reason in this connection is to still the water over the top of a small orifice which indirectly controls the amount of chemical solution applied to the water. This orifice is located flush with the crest of the weir, immediately behind one of its side faces, and draws off a small quantity of water proportionate to the head of water flowing over the weir. The by-passed water flows in a small stream through a pipe into a small dividing box where the amount can be further regulated if desired to compensate for periodic changes in the condition of the water supply. From the dividing box the water drops into a tipping meter which, through a ratchet and cam arrangement with cable, lowers the chemical outlet pipe in a feeding tank at a rate directly proportional to the speed at which the tipping meter is operating, and therefore, proportional to the



The Arrangement of the Chemical Feed Pump, Feeding Tank and the Tipping Meter.

head of water flowing over the weir. The chemical drawn off from the feeding tank is pumped to the mixing box on top of the tank and sprayed over the raw water through a horizontal pipe with numerous openings, which is located above and immediately in front of the weir. The water and the chemical solution are mixed by the drop from the weir and by changing the direction of flow 180 deg. in a horizontal plane, and further, by two baffles which interrupt the course of the water as it flows to the downcomer opening. From this opening, which is 19 in. in diameter, the water flows directly into the downcomer where reaction takes place as it passes to the bottom of the tank. From here the water rises slowly to the top of the tank while the coagulant with its impurities settle to the bottom. The treated water is drawn off at the top of the tank by skimmer troughs, which extend around the downcomer to insure a uniform draw-off. The sludge which accumulates in the bottom of the treating tank is drawn off through a sludge collecting system which consists of two horizontal grids of nine, 3-in. pipes, which have ¾-in. holes spaced uniformly along their bottom sides.

The chemical solution mixing equipment consists essentially of two steel tanks, one elevated above the other, the upper tank being used as a batch or mixing chamber in which the dry chemicals are introduced in a predetermined quantity, while the lower tank is a control or feeding tank, in which the chemical solution is stored ready for use, and from which it is drawn off as required. The batch tank is 5 ft. in diameter and 4 ft. high, and has a hinged cover through which the chemicals are introduced. The feeding tank is 10 ft. in diameter and 5 ft. high, and has a capacity sufficient for about 12 hours treatment.

The agitation system in both chemical tanks consist of baffles mounted on a vertical shaft which extends through the center of the tank. Both agitators are operated by one, three-horsepower electric motor through a vertical reduction gear. However, by means of a clutch

it is possible to cut out the operation of the batch tank agitator when it is not required, without interfering with the action of the agitator in the feeding tank. The introduction of a new supply of chemical solution from the batch mixer can be made into the feeding tank at any time without interrupting the feeding of chemicals to the water softening plant, and is by gravity through a short connecting pipe between the two tanks. The chemical solution is pumped to the top of the treating tank into the mixing box by a small triplex pump which is driven by a 1½ hp. electric motor.

Filters Supplement the Water Softener

The two filters at the treating plant are open type gravity sand filters and are 16 ft. in diameter and 7 ft. high. The water is conveyed to the filters through a 12-in. main which intersects a two-way 6-in. line, the ends of which serve each filter. The supply to the filters is governed by float valves which prevent the overflow of the filter tanks. Back-washing of the filters with treated and filtered water is provided for by a 6-in. line which extends from the 14-in. main discharge line of the plant to a connection with each of the filters.

From the clear water well, which has a capacity of 50,000 gal., water is pumped to the six storage tanks at the yard and terminal by one or both of the two motor-operated centrifugal pumps, each of which has a capacity of 750 gal. of water per min, against a head of 125 ft. These pumps were furnished by Fairbanks, Morse & Co. and are of a type similar to the raw water pumps.

The treating plant building is a brick structure with a double pitched, composition covered roof and a concrete floor. This building has a floor space 80 ft. long by 30 ft. wide and is divided into two rooms, a chemical storage room 30 ft. by 28 ft., which is occupied by dry chemicals, the chemical batch mixing tank and a small heating unit, and an equipment room 52 ft. by 30 ft. which houses the pumps, filters, chemical feeding tank and the control board, in addition to a number of meters and valves.

This water station was constructed under the general supervision of A. F. Blaess, chief engineer of the Illinois Central, and the actual planning and installation of the facilities were under the direct supervision of C. R. Knowles, superintendent of water service. The entire layout was designed and installed by the Railroad Water & oCal Handling Company, Chicago.

Special Type of Bituminous Crossing Pavement Proves Successful

By GEORGE HOLMES
Crossing Foreman, Department of Public Works, Detroit, Mich.

THE PROBLEM of providing a crossing pavement at the thousands of railroad crossings throughout the country, that will insure against excessive maintenance costs, and discomfiture and hazard to vehicular traffic, has led to many experiments with various materials and combinations of materials in seeking a solution. Extensive studies have been carried out in the city of Detroit, Mich., where the construction of all highway and street railway crossings within the city limits is under the direct supervision of the Department of Public Works. While practically every type of paving material has been used with more or less success, a specific type of bituminous crossing developed by the author and installed at many locations during the past few years, has exhibited unusual riding qualities and durability.

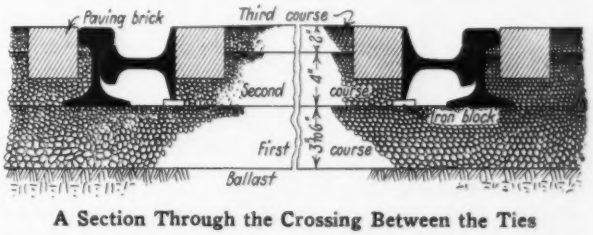
Specific Features of Crossing

This type of crossing is known as the Guarded Triple Penetration Bituminous Crossing, and, while many of its features are common to other forms of crossing construction, the particular method of laying the pavement in three sealed courses is somewhat unusual, contributing directly to the more permanent distribution of the aggregate and minimizing the effects of internal stresses set up by temperature changes.

In all cases a flangeway is formed on the gage side of the track rails, this being afforded by the use of old rails set on edge adjacent to the track rails, as shown in the accompanying drawing. This not only forms a substantial flangeway which is easily kept clean, but, of equal importance, a rigid backing to support the paving between the rails.

Immediately outside the bases of the flangeway rails and outside of the heads of the running rails, a single row of paving brick is laid, extending the full width of the crossing. This feature eliminates excessive wear and raveling of the bituminous pavement adjacent to the rails, caused by the destructive pounding of heavily loaded wheels passing from the rails to the pavement.

Of large importance in this type of crossing is the careful selection of the bituminous binding material used and the use of suitable and well graded aggre-



A Section Through the Crossing Between the Ties

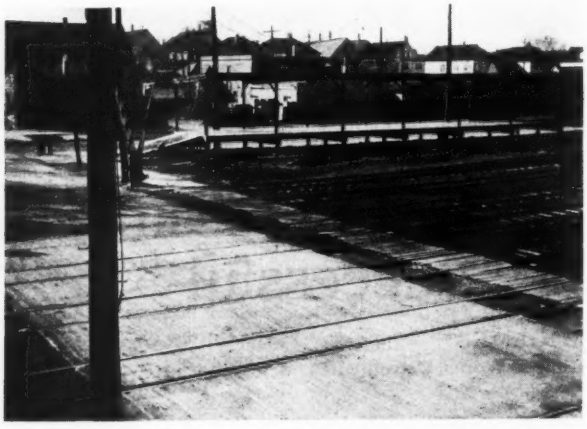
gate. While several grades of tar are suitable for various sections of the country, that best adapted for use in northern climates is one which has substantial body and sufficient carbon to withstand both extremes of temperature without bleeding or cracking. The aggregate recommended is clean hard graded limestone for the two lower courses and crushed granite for the wearing surface.

In the construction of this type of crossing the first operation is to clean out the highway roadbed and the cribs between the ties to a substantial foundation. In most cases three inches below the top of the ties is sufficient. With the ballast thus removed a thorough inspection should be made of the tires, replacing such as are defective with first class creosoted oak ties. Each tie should be plated and then tamped on stone

ballast to a solid foundation, elevating the track in the center of the crossing about one inch above the established grade of the track. This practice not only relieves the otherwise flat appearance of a crossing but provides for adequate drainage. Where many tracks cross a highway, suitable surface drains should be provided alongside the pavement from the center of the right of way to the side ditches or established grade of the highway.

In crossings less than 32 feet in width, all rail joints should be put outside the pavement. Where crossings are slightly wider than 32 feet, the joints should occur as near the edges of the pavement as possible, and in wide crossings extra length or welded rails are recommended. The obvious purpose in this is to eliminate, as far as possible, all track maintenance within the width of a crossing.

With the track in line, surface and gage, and fully



An Installation of Triple Penetration Pavement in a Heavy Traffic, Six-Track Crossing

spiked the first or foundation course of the pavement should be laid. This should consist of hard, clean limestone, ranging from 2½ in. to 1½ in. in greatest diameter. This material should be thoroughly tamped in the roadway and between the ties, using a mud pounder, until a level surface is obtained ½-in. above the tops of the ties. Employing a two-man tamper, the surface of this course should then be lowered flush with the tops of the ties.

Having previously prepared the tar binder, heating it to a temperature not greater than 275 deg. F. or less than 200 deg. F., this should be sprinkled thoroughly over the stone and ties, and the base and web of the rails. Following this, ½-in. limestone chips or ¼-in. crushed slag should be swept into the voids, tamped solidly in place and another coating of the hot binder applied.

The flangeway guards should be then set in place, each of these being formed by setting an old rail on edge, as illustrated, with the head of the old rail tight against the web of the running rail. To minimize the possibility of catching dragging equipment, the ends of each flangeway rail should be cut on an angle and as the rail forming the flangeway is usually of lighter section than the track rails, metal filler blocks should be placed under the lower edge of the base, on every third tie, in order that the upper edge of the base may be level with the top of the track. The flange rail should then be spiked securely in place.

The second course of the paving is laid to a depth of 4 in., using hard, clean limestone from 2½ in. to 1¼-in. in greatest diameter. This course should be tamped thoroughly, saturated with tar, and then swept with limestone chips or crushed slag and again tamped and tarred as was done in the case of the first course. Beyond the sides of the roadway this course should taper out to the elevation of the top of ties.

The third or wearing course should then be laid to an approximate depth of two inches, and should be made up of crushed granite ranging in size from 2-in. to ¾-in. in diameter. During this operation one row of hard paving brick should be laid adjacent to each flange rail and to the outside of the head of each track rail, making the surface of the brick flush with the top of rail in all cases. The granite course should be built slightly higher than the top of rail to allow for rolling, and after tamping, a liberal amount of tar should be sprinkled over the surface, but no more than the surface will absorb. After filling the voids as before with fine limestone chips or slag, the pavement should be thoroughly rolled with a power tandem roller weighing from 8 to 10 tons. The rolling should be done diagonally both ways of the pavement and also parallel with the track, until a hard, uniform and smooth surface is secured. Following the rolling a light seal coat of tar should be applied and the surface swept with a mixture of sharp dry sand and cement. After the pavement has been allowed to cool and set for a period of 24 hours, it may be opened to traffic, the ironing action of which will give the crossing the appearance of being paved with asphalt.

Railroad Bridge Converted into Temporary Highway Bridge

AS A consequence of an arrangement made between the Reading and the public authorities at Norristown, Pa., a bridge belonging to the railroad has been used temporarily as a highway crossing over the Schuylkill river pending the construction of a new highway bridge to replace a structure de-

The Swedesford Bridge as Built in 1883, with the Railroad on One Side and the Highway on the Other

stroyed by a fire. Because the burning of the old bridge cut off all pedestrian and vehicular traffic between the two sides of the river, the railroad converted its bridge into a highway bridge by removing the rails, laying a plank floor on top of the ties and providing hand-rails and opened the structure for high-

way traffic four days after the old bridge was destroyed.

The railroad bridge and the highway crossed the river side by side and were originally accommodated by one structure, one-half being used by the railroad and the other half by the highway. The first structure, known as the Swedesford bridge, was built in 1851 and when a second structure was built in 1883 follow-

The Swedesford Bridge as Remodeled in 1923, New Railroad Bridge on the Left

ing the destruction of the first bridge by fire the same arrangement of a combination railroad and highway bridge was carried out. The new structure consisted of four wooden truss spans of the Foreman type, with three trusses to the span, the center truss separating the driveway from the portion used for railroad service. The new bridge continued to carry the same traffic as that carried by the original bridge until 1903 when the Norristown & Main Line Connecting Railroad was opened for service with a new bridge across the Schuylkill, approximately 0.8 mile above the Swedesford bridge, thereby diverting much of the traf-

The Railroad Bridge Planked for Highway Traffic

fic from the old bridge. In 1922-1923 the Reading replaced the railroad portion of the bridge with eight spans of deck plate girders with an open deck floor, using the old piers and constructing four intermediate concrete piers. The highway portion of the bridge was continued in use until July 10, 1924, when it was entirely destroyed by fire which also damaged the railroad bridge considerably, especially the deck.

The destruction of the highway bridge cut off all pedestrian and vehicular traffic between Norristown and Bridgeport, since the only other highway bridge at Norristown was destroyed by fire on April 14, 1924. To provide for highway traffic, a temporary floor was placed on the railroad bridge and opened for service on July 14, after an interruption of only four days. Railroad traffic was routed over the bridge of the Main Line Connecting railroad pending the construction of a new highway bridge.

How the Illinois Central Has Reduced Accidents

By J. D. WHITE
Superintendent of Safety, Illinois Central, Chicago

ACCIDENTS that occur in the maintenance of roadway and structures, resulting both in personal injuries and in damage to property, may usually be traced to man-failures. We must seek to prevent such man-failures through education and supervision. Good safety work is based on the careful selection of men for employment, the stabilization of employment as far as possible, the education of men in safety practices and constructive discipline. Roadmasters understand thoroughly that they are responsible for the safe operation of their departments and that division superintendents look to them to see that safe methods are followed at all times.

Supervisors and Foremen Bear Responsibility

All accidents reported on each division are tabulated in the roadmaster's office and are charged up to the foremen and supervisors under whose jurisdiction they occur. At the end of each month supervisors and foremen are rated according to their division standing, which makes it a simple matter to pick out the points where safety instruction is most needed.

Track supervisors are required to know that their foremen are supplied with copies of the rules, educational bulletins, posters, comparative statements and other safety literature. The supervisors are required to make a talk on safety to each gang under their jurisdiction whenever necessary. We have demonstrated the beneficial psychological effect of having track supervisors impress upon their foremen the fact that a section foreman holds an important position, that the management depends upon him for honest, careful supervision, and that a foreman will not be rated 100 per cent unless his work is accomplished without injury to the forces under him.

An Example Made of Every Accident

Whenever an accident of any kind occurs, the track supervisor on that district makes a thorough personal investigation of the case, points out to all concerned the fault or faults discovered and tells them how to prevent the recurrence of such an accident. We rely to a large extent upon the foreman to prevent accidents. Therefore we give particular attention to his training. Our maintenance of way department operates with modern methods under up-to-date rules which cover practically every phase of the work and which include a good safety program. Copies of the rules are in the hands of all foremen, who are required periodically to pass satisfactory examinations. We

* Abstract from a paper presented before the Safety Section of the American Railway Association at its sixth annual meeting at St. Louis, Mo., April 27 to 29.

impress upon the foreman the importance of learning his own duties and of being on the job at all times to see that his men follow safe methods. He must thoroughly understand and always bear in mind that safety is the first and most important consideration and he must fully appreciate the hazard of carelessness among his men and the action he must take to prevent such carelessness. For example, he must warn his men against placing themselves in dangerous positions while at work; he must not permit them to get on or off moving engines or cars, and he must see that they clear tracks properly for passing trains.

Recognition of Results Stimulates Interest

We believe in showing the foreman clearly what we are trying to accomplish and how he can function in the plan, and thus we gain his interest in making a good record for his department. The modern foreman is a friend to the workmen, and he can get his men to work carefully because they are his friends.

In order to increase interest and competition among foremen, we have adopted what is termed a "merit card." This is a certificate about the size of an annual pass, bearing the signature of the superintendent of safety and testifying to the fact that the foreman holding it has handled his gang six months without a reportable injury. The adoption of these cards has proved highly successful.

We make it a point to start the day with safety. Our foremen take a few minutes at the toolhouse in the morning to discuss briefly with their men the line-up of work for the day. In the course of such discussions the foremen always caution their men to be careful throughout the day. Some foremen keep small blackboards in their tool houses upon which are written each morning safety slogans suggested by the men. In other places signature blanks are provided for the men to sign safety pledges each morning as they leave the toolhouses. Some foremen name men each morning as "safety captains" to supervise the operations for the day.

Education and Definite Instructions are Important

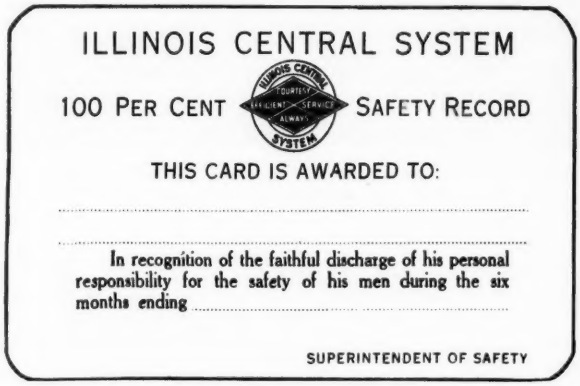
The conduct of the day's work is the real test of our safety program. Most of the injuries sustained by maintenance of way employees are to the hands or feet and are caused by careless handling of tools or materials. We try to overcome these by insisting upon the constant exercise of care. Foremen and workers are taught to appreciate that there is a vast amount of material passing through their hands and that there is constant danger in the handling of it. Special care is demanded when handling ties, rails and other heavy material, and the foreman must have an understanding among his men as to how the work will be done in order to prevent confusion and injuries.

We have reduced the danger of rupture and sprains by teaching our men to lift motor cars or hand cars and heavy material of all kinds while standing with their feet and knees close together. We have prevented some injuries by furnishing section gangs with 10-lb. sledges and requiring them to use them in cutting rails instead of using spike mauls.

Good housekeeping is one of the fundamental principles of safety work on the railroad. This applies not only to keeping everything in its place but also to correcting unsafe conditions. Each foreman is taught to look after the property under his immediate jurisdiction. Toolhouses, tool cars and tool boxes must be kept in order. The premises must be kept clean and free from any excess accumulation of new or scrap material. In yards, no track material is placed between tracks or distributed for use until required.

Tools must be kept in good, serviceable condition and the section foreman must make sure at the beginning of the day's work that all tools are in such condition. While he is held responsible for all accidents due to defective tools, the workers themselves are required to know that the tools which they use are in proper condition. We operate supply cars over all divisions every sixty days to replace defective and worn out tools. The supply cars are accompanied by the track supervisors over their respective districts. In emergency cases new tools may be obtained from division storekeepers.

The motor car or hand car is inspected by the foreman and needed repairs or adjustments are made before starting out to work. Going to or coming from work, the foreman must know the location of all trains near him, particularly passenger trains, and if he is where he cannot get a line-up on all trains he must use good judgment and run no risk. He must make sure that he has the proper flagging equipment and that the tools are placed on the car so they will not jar off. He must instruct his men not to get on the car from the side or front or while the car is in motion. Attention is directed every day to the importance of looking in both directions before stepping on any track. Section men are also required to observe passing trains for defects.


ILLINOIS CENTRAL SYSTEM

100 PER CENT SAFETY RECORD

THIS CARD IS AWARDED TO:

.....

.....

In recognition of the faithful discharge of his personal responsibility for the safety of his men during the six months ending .....

SUPERINTENDENT OF SAFETY

The "Merit Card" Awarded Foremen with a 100 Per Cent Safety Record

Duties of Track Walker Are Important

The duties of the track walker in the section gang are next in importance to those of the section foremen. Section foremen are held responsible for seeing that their sections are walked over and examined every day. Track walkers must carefully examine switches, frogs, bridges, fence and wire lines and report promptly to their foremen any defect they cannot fully repair themselves. Supervisors and bridge and building foremen are responsible for seeing that the required clearances are maintained between track and buildings, stock pens, bridges, etc.

I believe the most important thing in safety work among maintenance of way employees is to teach the foremen the causes of accidents and injuries and to keep them alert and interested in safety measures. When foremen always tell their men what they are going to do and how they are going to do it and arrange in advance to guard against unsafe methods, accidents will be reduced to the minimum.

Chesapeake & Ohio Employs Paint Gangs Entire Year

Organization of Forces on a System Basis Permits Transfer of Men from One Division to Another with Change of Seasons

FOR MANY years the bridge and building painting on the Chesapeake & Ohio was conducted by the division organizations on a strictly seasonal basis. Forces were organized each spring, built up to a maximum in the summer and laid off each fall. This resulted in a heavy turnover, and the employment largely of inexperienced men who took no interest in their work. The morale was unsatisfactory and painting costs were high. The quality of the work was often inferior. Furthermore, the disbanding of the gangs in the fall resulted in the scattering of the equipment with the result that it was frequently not to be found when the work was resumed in the spring.

The Chesapeake & Ohio extends from Norfolk, Va., and Washington, D. C., to Columbus, Ohio, and Chicago, through a territory offering a rather wide range of climatic conditions. Thus whereas a large part of the line west of the Appalachian range is subject to long and severe winters, the portion of the line east of the mountains enjoys mild winters that do not offer serious obstacles to the continuous conduct of painting work. Moreover, on this part of the system the line owns a number of large and important structures such as the coal dock at Newport News, which give rise to extensive painting work at frequent intervals. A study of these considerations led to the conclusion that if bridge and building painting could be organized so that the work on the western and northern portions of the system were done in the summer months and that on the eastern portion during the winter it would be possible to carry on substantially all the work required with a permanent force and thus eliminate the serious objections and disadvantages that have been experienced as a consequence of an entire lack of permanence in employment in bridge and building painting.

The Sciotoville Bridge, Which Was Painted Last Year

This suggestion obviously implied the organization of painting on a system basis under the direction of a general supervisor of painting reporting to the superintendent maintenance of way, a plan which also afforded opportunities for a greater degree of standardization of painting practices over the entire system. However, in carrying out this idea, which became effective on January 1, 1925, no definite departure was made from the division form of organization to which the Chesapeake & Ohio system is committed. Painting budgets originate with the division engineer, as in the past, and painting gangs are carried on the division payroll of whatever division they are employed on. But the general supervision of the painting by a system officer insures system control of the entire program and system supervision of the work.

The organization of painting was, however, not limited to the idea of establishing permanent forces. It included also provision for the adequate outfitting of each gang with camp and equipment cars, modern painting facilities, the development of a plan for the control of the quantity of the material used, a set of standards of paints and colors for structures of various classes and a system of time and material reports affording a thorough check of costs and of the progress of the program.

The first requirement was the organization of gangs on a permanent basis. Whereas as many as 8 to 10 paint gangs were formerly employed during the summer season it was decided to organize only four permanent gangs of 14 men each, consisting of a foreman, six first class painters, four second class painters, two helpers and a cook, with the idea that one additional gang would be organized if found necessary but that any enlargement of the force found necessary would be made primarily by adding men to the permanent gangs. For example, in the painting of one large bridge, which was carried out last season, the gang was increased to an average of 50 men.

Men Were Carefully Selected

The foremen and men were carefully selected. No effort was made to employ experienced painters; instead, preference was given to young men who would readily become adapted to work under the conditions imposed on a railroad and especially to work on high bridges. Special pains were taken to make the working conditions attractive by providing first class camp

COST OF PAINTING BRIDGE NO.____

Half Month of _____ Location _____

Date	Hours Cleaning 1st Grade	Hours Cleaning 2nd Grade	Hours Cleaning Helper	1st Coat Hours Applying 1st Grade	1st Coat Hours Applying 2nd Grade	1st Coat Hours Applying Helper	2nd Coat Hours Applying 1st Grade	2nd Coat Hours Applying 2nd Grade	2nd Coat Hours Applying Helper	3rd Coat Hours Applying 1st Grade	3rd Coat Hours Applying 2nd Grade	3rd Coat Hours Applying Helper	Building Scaffolds 1st Grade	Building Scaffolds 2nd Grade	Building Scaffolds Helper	Miscl. Foreman	Hours Cook

MATERIALS APPLIED

Description Quantity

_____

_____

_____

(Signed)

INSTRUCTIONS: Unless bridge is painted complete, no report should be made. Report to be mailed Supt. Maintenance of Way at close of each half month.

Foreman. _____

The Semi-Monthly Report Affords a Record of the Cost of Painting Each Structure.

car equipment and facilities for the furnishing of good meals. The outfits furnished the men include bunk cars, a mess car and a painting equipment car. The living cars are of good construction, attractively painted, and are provided with screened doors and windows. The railroad furnishes the bunks and mattresses but each man is expected to provide his own bedding, which of course is no hardship if he is assured reasonably permanent employment. The railroad supplies all cooking utensils and pays the wages of a cook, but the men pay for their meals at cost on a co-operative basis. The foreman serves as the commissary, calculating the cost of meals each 15 days from the expenses incurred during the period and collects the money from the men. This plan has been effective in giving the men good, wholesome food at an attractive rate, running as low as 59½ cents per day for some periods.

Each crew is provided with an adequate complement of modern painting equipment, including an eight-gallon DeVilbiss paint spraying machine and a motor car which will readily carry 18 men and also haul a trailer. The system provides for the centralized control of paint stocks. Ready mixed paints are used almost entirely. Every bidder on painting contracts is required to furnish three, one-pint samples of each kind of paint; one sample in glass for a check of color and oil, one sample to serve as a permanent record and one for chemical analysis if any question arises as to the material furnished being equal to sample. Fully two-thirds of the paint used is furnished in five-gallon cans. Paint is purchased in barrel lots only for unusually large jobs. The use of smaller units has been found to result in a marked reduction in the waste of paint.

Budget Originates on Division

As stated above, the annual painting budget originates with the division engineer and after consolidation and checking by the general supervisor of painting is submitted to the superintendent, maintenance of way. After the budget is approved a schedule for the paint gangs is prepared by the general supervisor of painting in consultation with the division officers. In general, a gang starts out at one end of a division and completes all work authorized as it moves over the line, regardless of the types of structures. With the use of the motor cars, it is customary to work as far as 8 to 9 miles from the camp, which is moved ahead by the local freight whenever this distance is exceeded. With this arrangement no difficulty has been experienced in doing two-coat work from one location of the gang.

The paint gang is under the supervision of the supervisor of bridges and buildings of the particular division on which it is at work, and he exercises de-

THE CHESAPEAKE & OHIO RAILWAY COMPANY
QUARTER MONTHLY REPORT OF EXPENDITURES
SYSTEM PAINTING FORCE

Date _____ 19____

Have worked the following forces on _____ Division, during the period ending _____ 19____

Classification	Rate	Date Number Men	Date Hours Worked	Date Number Men	Date Hours Worked	Date Number Men	Date Hours Worked	Date Number Men	Date Hours Worked	Date Number Men	Date Hours Worked	Date Number Men	Date Hours Worked	Date Number Men	Date Hours Worked	To be used by Supt. M. of W. Total	To be used by Supt. M. of W. Amount
Foreman																	
Painter-1st grade																	
Painter-2nd grade																	
Painter-Helper																	
Painter-Sign and Signal																	
Cook																	

INSTRUCTIONS:
Reports should be made quarter monthly, for periods ending on the 8th, 16th, 24th, and last day of each month. If a quarter is divided between two or more divisions, separate report should be made for time worked on each division. Mail report to Supt. Maintenance of Way, promptly after each quarter.

_____
Foreman

The Quarter-Monthly Report Affords a Check on the Money Being Spent.

tailed control of the work as long as the gang is within his jurisdiction. However, he is not permitted to change the program without authority from the general supervisor of painting.

The paint gangs are carried on the division payroll, and to this end the foremen make out daily time reports, which go to the division supervisor of bridges and buildings. However, the general supervisor of painting keeps thoroughly in touch with the program of the work, the money being spent and the unit costs by means of semi-monthly and quarter-monthly reports, which the foremen send to the superintendent maintenance of way. The quarter-monthly reports, which are made out on the eighth, sixteenth, twenty-fourth and last day of each month, show the number of men of each class employed each day and the number of hours worked and afford an opportunity to check the money being spent against the appropriation. The semi-monthly report shows a distribution of the labor costs under six headings, as well as a statement of the material applied on each structure.

Standardize Painting Practices

Another feature of the plan of reorganizing the painting work on the Chesapeake & Ohio was the standardizing of painting practices over the system. Under the old plan of division control of painting each division was largely a law unto itself. And it was very difficult to secure uniform shades of standard colors, uniform painting practices and standards of paint condition on various classes of structures. As a means of effecting a greater uniformity of standards throughout the system a list of standard paints has been prepared, outlining definitely the purpose for which each of these paints is to be used. This list shows the stock number, unit of measure, name of the paint and the purpose for which it is to be used.

The new plan of conducting painting operations worked well from its inception, but it took a big job to show its real worth. Such a job was on the schedule in the painting of the Chesapeake & Ohio bridge over the Ohio river at Sciotoville, Ohio. This bridge was completed in 1917 at a cost of $1,500,000. It has a total length of 3,450 ft. The approaches consist of 70-ft. to 110-ft. deck plate girder spans and two 153-ft. deck truss spans. The river itself is spanned by double-track continuous trusses 1,550 ft. long, with one support in the center, making two spans of 775 ft. each. This main structure contains 13,144 tons of steel. The track is 120 ft. above the water, while the distance from the top of rail to the top of the top chords is 136 ft.

Seven months after the organization of system paint forces a real painting record was established when these forces were assigned to the job of painting this bridge. They applied 3,151 gal. of paint in 46 working days, with an average force of 50 men and without a single reportable accident. The bridge was thoroughly cleaned and 731 gal. of a standard primer paint applied. This was covered with 2,420 gal. of a well-known graphite paint. Detailed expenses of painting this bridge, exclusive of the cost of the paint, were:

Cleaning	$ 1,647.38
Applying first coat	2,935.54
Applying second coat	5,146.86
Building scaffold	1,282.06
Cooks	350.03
Foremen	554.40
	$11,916.27

Other work completed by these forces has been equally satisfactory, and it is felt that even better results will be obtained as the organization is perfected.

The system plan of organizing maintenance of way and structures painting on the Chesapeake & Ohio was developed under the direction of L. B. Allen, superintendent, maintenance of way. E. L. Wigglesworth is general supervisor of painting, with headquarters at Richmond, Va.

Santa Fe Renews 107 Ties Per Mile of Track in 1925

THE ANNUAL tie renewal statistics for 1925, which have just been compiled by the Atchison, Topeka & Santa Fe, again show with increasing significance the savings accruing to that road from its consistent adherence to the policy of carefully selecting ties, applying appropriate treatment and protecting the ties against mechanical destruction. Thus, as indicated in the accompanying table, which is a summary of tie renewal records from 1898, the average number of ties renewed per mile of track on the Santa Fe in 1925 was only 107, the smallest number in a long record of generally decreasing renewal requirements. In considering this figure it should be borne in mind that it is an average of the tie renewals per mile of all tracks now in operation on the Santa Fe system, including a relatively large mileage constructed within the last few years on which the renewals are as yet light. For the purpose of the Santa Fe, however, in comparing the annual requirements on the system, this figure and the others compiled on this basis are substantially correct and readily comparable with the figures for previous years, since the same policy of computation has been followed in the past.

RECORD OF TIE RENEWALS ON THE ATCHISON, TOPEKA & SANTA FE SYSTEM

Years	Total miles	Total ties inserted for renewals	Total ties inserted per mile of track	Aver. number of ties inserted per mile of track for five-year period
1898	8,185	2,751,849	336	.....
1899	9,028	2,246,250	249	.....
1900	8,804	1,687,537	192	229
1901	9,368	1,557,880	166	210
1902	9,557	1,954,823	204	215
1903	9,768	2,352,502	241	228
1904	10,237	2,770,306	271	234
1905	10,885	2,788,378	256	251
1906	11,637	2,291,997	197	263
1907	11,694	3,364,921	288	267
1908	12,169	3,666,798	301	272
1909	12,601	3,690,633	293	286
1910	13,379	3,758,984	281	273
1911	13,889	3,738,854	269	251
1912	14,488	3,192,585	220	228
1913	14,766	2,850,823	193	213
1914	15,293	2,728,629	178	200
1915	15,400	3,191,823	207	187
1916	15,517	3,118,941	201	180
1917	15,661	2,483,651	158	173
1918	15,931	2,456,203	154	164
1919	16,087	2,302,952	143	153
1920	16,899	2,753,673	163	153
1921	16,912	2,514,325	149	148
1922	17,005	2,693,005	158	142
1923	17,346	2,229,201	128	131
1924	17,709	2,046,054	115	.....
1925	18,054	1,936,497	107	.....

Of possibly more significance than the low average renewal requirement for 1925 as compared with previous years, and indicating with somewhat greater accuracy the general trend of renewals on the Santa Fe, are the figures in the last column of the table which represent the average number of tie renewals per mile over a period of five years. These figures eliminate the effect of fluctuations in tie renewals from year to year. An examination of these figures shows conclu-

sively the consistent reduction made in the average tie renewals per mile since 1909, when they amounted to 286 ties, to 1923, when the average of the renewals over the five-year period was only 131 ties, or a reduction of about 54 per cent. The most striking evidence of the results being obtained on the Santa Fe by its tie policy is presented in the first three columns of the table, which show that whereas 2,751,849 ties were renewed in 8,185 miles of track in 1898, and 3,690,633 ties replaced in 12,601 miles of track in 1909, only 1,936,497 were required in the 18,054 miles of track of the Santa Fe system in 1925.

A further analysis of the Santa Fe's tie report shows that the average number of renewals per mile on all classes of tracks on the Gulf lines of the system (the lines south of Purcell, Okla.) was 176 ties, on the Coast lines (west of Albuquerque, N. M.) 152 ties, on the Western lines (between Newton, Kan., and Albuquerque) 93 ties, and on the Eastern lines (east of Newton) only 53. The average number of renewals on the Gulf lines for the past five years was 157, on the Coast lines 189, and on the Eastern and Western lines, 103. The wide fluctuation in the average number of the renewals over the system and in particular the low requirements of the Eastern and Western lines to a considerable extent reflects the effect of the more favorable climatic conditions prevailing over those lines and to a much larger extent the results derived on these lines where the practice of treating ties has been of longest standing and where practically all of the ties have been subjected to some kind of treatment. With a continuance of the Santa Fe's policy of treating ties, which is reducing yearly the number of untreated ties in service on the Gulf and Coast lines, it is confidently expected that the average number of the renewals per mile on these lines in the future will gradually approach the low average requirements on the Eastern and Western lines.

How to Measure Work*

By Charles Gibson
Section Foreman, St. Louis Southwestern

THIS is my motto: "Believe in yourself, your fellow man, your job and your superior officers, for no man can do anything worth while who does not believe in these things. First of all, a man must believe in his power of doing things; he may disappoint himself; he may disapprove of himself; but he must go on and have faith that he can do the things he has set out to do. A man must have faith in his fellow man if he is to succeed in any worth while sense. The greatest of men are those who trust other men. The little man meanly distrusts his fellow man. The great man nobly trusts his fellow man. Of course, at times we meet with disappointment in dealing with men, and yet we must not falter in our faith in humankind, which, after all, is the best thing we know and will grow better only in the measure in which we trust it. A man must believe in his work if he is to do anything in the world. 'Chuck' your job if you don't like it, but don't loaf at it and don't think all the time of its difficulties. All jobs are difficult; think of the challenge of it; claim the joy of doing what other men say cannot be done—what you may half fear to undertake."

When we speak of the measure of work we mean the standard by which the extent or value of work is compared, as the roadmaster may take the best crew on his division and measure or compare the other crews' work by his crew. He may have one crew on his division that applies a cross tie an hour for each laborer—he will expect the other crews to do the same. So we measure work by the other man's work. Each day we should measure our day's task and work to it, as this is a part of our duty—to know what a crew of men can do in a given time.

In the care of the roadbed, we should measure our time so that we can do some of this work each month in the year and avoid having an overload of cleaning ditches, tiling and sloping cuts in the fall. We should measure our work so we can spend more time in cleaning up, as a section rid of old ties, brush, rubbish, etc., looks better and is easier to clean in the fall when grassing and mowing time comes. Watching roadway should have special attention, such as walking and patrolling track. Money spent in patrolling track is money well spent if done at the right time. This time is during heavy rains and wind storms; not the next day after the storm.

Some sections require little time for bank protection, while on others it is a very important thing. We should watch ditches and change their course before they get too close to the track. If we have any work involving track changes, we should consult the roadmaster and he will measure this work for us. We should watch and measure our work so as to keep all bridges repaired, keep all drift cleared from under our trestles, and keep grass cleaned around them to prevent them from burning in case the right-of-way should catch fire.

We should be careful in handling ballast. We have good ballast now and we should not mix it with dirt when working our track. We should keep the border or ballast line straight where we work. It is easy to measure our work for applying cross ties, as we try to put in one tie per man per hour, but we should be careful in applying these ties not to take out ties that are serviceable and not to dig through the ballast for a small tie. We should also see that the tie applied is tamped. In applying switch ties we should be careful to use the right length of tie, as the cutting of switch ties is wasteful. We should see that the tie is properly spaced and tamped.

Track maintenance is one of the biggest and most important jobs on the section, since it involves such work as lining and surfacing track, gaging, tightening bolts and spikes and several other tasks, all of which have a direct influence on the general condition of our track. We should have a standard to work by for each of these different items and a program for doing our work; thus we might select Monday for picking up joints and lining track; Tuesday for gaging, and so on for each day in the week. By planning our work in this way we can get over our entire section with each class of work without neglecting anything.

Right-of-way fences should have more work done on them than has been done in the past. If we have a gap in our right-of-way fence and neglect it, allowing some farmer's cow to get on the track and be killed, we have wasted enough money to repair the fence over the entire section. We should keep our crossings in first class shape. If we allow the crossing planks to rot out and the crossing to get rough, causing some joyrider to kill his engine on the track in front of a locomotive, we have wasted enough to build a new crossing.

* Abstract from a paper presented at the fifth annual meeting of the Sanitary Engineering and Maintenance of Way Departments of the St. Louis Southwestern at Paragould, Ark., on April 16, 1926.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE AUGUST ISSUE

1. *What can be done to improve maintenance conditions on embankments built of gumbo, on which it is difficult to maintain track in either wet or dry seasons?*

2. *What is the best type of pump for foundation cofferdams or open caissons? If centrifugal pumps are used which are preferable, direct connected or belt driven units?*

3. *When is the best time to cut brush on the right-of-way with the view of preventing or retarding its further growth?*

4. *Is the use of short ties or wooden blocks advisable in the installation of circle rails for turntables?*

5. *Is it practical and economical to prevent the growth of grass and to improve the drainage of the ballast by lowering the shoulders of embankments by means of a spreader or otherwise and then bringing them up to grade with cinders?*

6. *What are the relative merits of precast concrete curb and curb built in place for station platforms?*

7. *What is the most economical method of preventing the erosion of embankments from wave action during times of occasional back water?*

8. *What are the relative merits of cast iron and wrought iron or steel pipe for underground water supply lines less than 4 in. in diameter?*

Anchoring Track Against Floods

What is the best method of anchoring track on embankments subject to overflow?

The Track Is Anchored to Posts Embedded in the Embankment

By J. W. Kern

District Engineer, Illinois Central, New Orleans, La.

To anchor track subject to overflow, a tie, piling cut-off, or other sound timber of suitable length, through which a 1½-in. hole has been bored not less than 6 in. from the upper end, should be driven so that the top of the timber is beneath sub-grade. A casting designed to fit the base of the rail section and secured to it by means of a wedge and cotter key is provided with a lug suspended below the base of rail, with a 1 in. or 1½ in. opening. This casting, placed on the rail opposite the locations where piling or timber has been placed, is secured to the timber by means of a galvanized cable of such diameter as may be desired, preferably not less than ⅜ in., looped through the openings in the timber and casting, securing the overlapped ends with not less than two clips. The boring in the timber should be provided with a short piece of pipe in order to reduce the possibility of splitting. This method of anchoring does not interfere with ordinary maintenance operations, and it is only necessary to loosen the casting when it is desired to line or surface the track, or perform any other work which might affect the anchor itself. Spacing of these anchors depends upon the kind and intensity of the overflow to which the track is subjected. Ordinarily, spacing not to exceed 100 ft. is suggested.

In locations subject to overflow from head water, the distance of the anchor from the rail and slack in the cable need not necessarily enter into consideration. It is important, however, in locations subject to overflow from the effect of wind, tidal wave and the upward surge of water under the track structure that the anchor be placed so as to provide the greatest amount of slack possible, to the end that the track may not be carried from the embankment nor the holding power of the anchor diminished more than can be avoided. In such locations it is well to anchor the track on both sides.

Stone Ballast Is Sometimes Sufficient

By Supervisor of Track

The extent to which it is necessary to anchor track depends upon the nature of the overflow and various other conditions. Where the water comes from hilly country and collects in a limited area until it overtops the track, there is apt to be a rapid increase in head, which will create a strong current flowing over the roadbed and necessitate anchoring the track to posts set into the embankment on the upstream side of the track; the same condition often exists in the case of embankments traversing the so-called "bottom lands" of the larger streams with steep hydraulic gradients. On the other hand, tracks in bottom lands where the hydraulic gradient is low are often held in place by the use of stone ballast, care being taken that the ballast is not too fine. In the latter case the critical time begins when the water overtops the track and continues until it has leveled up on both sides of the embankment. If the track or embankment can be held until that time no further trouble need be anticipated unless drift should collect on the track and create eddies that may cause washouts. The writer has

seen trains operated safely through water which covered the rail to the depth of several feet, the limiting factor being the height of the firebox above the rail.

Single-Acting and Double-Acting Track Jacks

What are the relative merits of single-acting and double-acting track jacks?

The Single-Acting Jack Is Preferred for Section Work

By G. G. Smart
General Roadmaster, Great Northern, St. Paul, Minn.

The double-acting jack does not have the advantage in lifting speed that is generally credited to it. If the load is heavy for the number of men operating it there is little, if any, difference in the lifting speed of the two jacks. This is due to the fact that men operating the double-acting jack have to change their position for each separate stroke, while with the single-acting jack the upward stroke is made quickly and with little effort.

Where the load is light or a sufficient number of men are used on the bar to pump the track jack, a little greater speed can be made with the double-acting jack. For this reason it is better adapted for use in extra gangs. The single-acting jack has the advantage of not pushing the track out of line, and for small crews it is easier for one man to operate and does not tire the men as quickly as a double-acting jack.

Prefers the Single-Acting Jack

By George T. Donahue
Assistant Division Engineer, New York Central, Rochester, N. Y.

From my experience as to the relative merits of the single-acting and double-acting track jacks, I am decidedly in favor of the single-acting jack, since the double-acting jack throws the track out of line and has a tendency to kick out at the bottom when under load.

Should Turnout Rail Be Heavier?

On branch lines with rail of a light and often obsolete section, to what extent is it practicable to use turnout material of a heavier standard section to promote economy and safety?

Safety and Economy Are Promoted by Using Heavier Turnouts

By Track Man

The practice of using standard turnout material heavier than the light rail on branch lines is usually justified from the standpoints of safety and economy unless the traffic is extremely light. The section chosen should be the same as would probably be used when the branch is relaid with heavier rail, as this will often obviate the necessity of changing out many of the turnouts at that time. The turnout is usually the weakest point in the track, and this is especially true when the track and turnouts are of light sections. Economy is effected by the fact that the use of standard sections avoids the necessity of keeping a supply of the light rail on hand or, in the case of obsolete sections, of taking up rail and shipping it to the shops when new turnouts are to be made. The best results are obtained by laying the full lead and the main track through the turnout with the heavier rail, using compromise joints ahead of switch and back of frog.

Not Recommended Unless Rail Is to Be Relaid Soon

By G. G. Smart
General Roadmaster, Great Northern, St. Paul, Minn.

On branch lines where rail is of an obsolete section and is heavy enough for the service and no relaying is contemplated, sufficient good rail can be taken from track to make the necessary frogs and switches to take care of requirements.

Where it is planned to relay a branch line within a few years with a heavier rail, there are no objections to the use of switches of a larger section in advance of the relaying. This gives a stronger turnout and one on which the maintenance should be less, and eliminates the expense of relaying turnouts when the heavier rail is placed on branch lines. These advantages more than offset the compromise joints which have to be used in main track to connect up the two sections of rail.

How to Make Grass Grow on Embankments

What is the best method of inducing a growth of grass on the slopes of high embankments and what varieties of grass are best suited for this purpose?

Bermuda Grass in the South and Blue Grass in the North Give Best Results

By M. M. Backus
Assistant Engineer Maintenance of Way, Illinois Central, Chicago

In the regions traversed by the Illinois Central, Bermuda grass provides the best sodding for banks south of the latitude of St. Louis, while blue grass is the most satisfactory north of St. Louis. Attempts to start a growth of grass by seeding the sides of embankments have not been successful, and the only sure way to start blue grass is by smoothing off the surface and putting on a solid covering of sod, which must be tamped thoroughly.

Bermuda grass may be started more cheaply, as it can be planted by cutting the sod into pieces about 6 in. square and placing them in holes dug into the embankment from 12 to 18 in. apart, and of a depth so that the grass will be a little below the surface, after which the hole is filled with loose earth and beaten down. To promote the growth it is advantageous to spread manure over the sides of the bank; and in some cases where the material of the fill was not favorable to the growth of vegetation commercial fertilizer has been used with good effect. In such places good results have also been obtained by ditching shallow cuts which had a good growth of Bermuda grass and spreading the material over the sides of the fill, this method often starting a growth of the grass without further effort. On some very steep slopes it has been found necessary to sod in solid strips, spaced from 14 in. to 16 in. apart.

Various Grasses and Shrubs May Be Used

By W. E. Brown
Assistant Chief Engineer Maintenance of Way, Pennsylvania, Pittsburgh, Pa.

For slopes open to sunlight a mixture of Kentucky blue grass and Alsace clover usually gives good results, provided the soil is properly fertilized and sufficient lime used to counteract acid. For shady slopes orchard grass or some of the sedges will probably give better results. In order to prevent wash if banks are

first seeded in the spring it is sometimes advisable to add a small percentage of oats to the grass seed, thus obtaining a comparatively long root growth quickly. For banks with some surface stone, trailing roses or honeysuckle are often preferable; the vine chosen depending upon the percentage of stone on the surface. Vines require much less care and fertilizer than any of the grasses, and cuts so treated present a pleasing appearance.

For protecting slopes in very stony cuts or banks of wet cuts liable to slide in rainy seasons, the quickest results can be obtained by transplanting indigenous shrubs from the surrounding hillsides. If young shrubs from ¼ in. to ⅝ in. in diameter are chosen, locust can be transplanted in ordinary spring seasons with about 90 per cent effective results. When locust is used the only future care required is sawing off the main stem a foot above the ground surface when it reaches a diameter of about 3 in., thus eliminating borers and causing the roots to put out sprouts which add to the security of the bank. Fivebark and elder also transplant successfully. For extremely wet cuts willow and poplar slips are easily planted. If branches are cut in the spring about the time the sap begins to run, 80 per cent of either will usually live and provide a quick root growth.

Locomotive Cranes or Pile Drivers

To what extent can work trains for bridge work be supplanted by locomotive cranes or self propelling pile drivers?

It Depends on the Cost of Building a Spur for the Crane or Pile Driver

By B. F. Crawford

Bridge Foreman, C. B. L. Company, Powers, Ore.

I believe that work trains for bridge work may be supplanted by locomotive cranes or self-propelled pile drivers where the work is of such magnitude that the cost of maintaining a work train plus the cost of time lost in clearing traffic will exceed the cost of building a temporary spur long enough to accommodate the crane or pile driver and two or three cars. If the spur is built close to the span, the crane may be used as a hoist while clear of the main track, particularly when wooden spans are being replaced. Practically no time is lost on account of traffic, as there are usually more than enough odd jobs to fill the short time required to clear traffic; there is also very little, if any, delay to traffic. By arranging for the delivery of material in the order needed and at the proper interval, cars may be set out and unloaded when the time can best be spared.

It Depends Upon the Traffic and the Amount of Work

By Bridge Engineer

The extent to which it may be possible to dispense with a work train engine in connection with work performed by self-propelled pile drivers and locomotive cranes can often be determined only by a study of the individual jobs in connection with the program of work for the different operating subdivisions. It will depend on the amount and character of work at each point, the amount of traffic, and the advisability of installing temporary sidings to avoid the necessity of running to passing tracks to clear the line for traffic. In addition to saving time in clearing the line, a temporary siding long enough to accommodate several cars will often permit the work equipment to perform useful work when it cannot occupy the main track.

With a continuous program of pile driving over a branch line with moderate traffic it is often possible to perform the work without the necessity of a work train engine, since the pile drivers have a traveling speed of from 10 to 20 miles per hour and can haul the outfit cars as they move from one location to another.

Do You Know Where the Pipes Are?

Where the plats of extensive water facilities are incorrect or incomplete, to what extent are expenditures justified in tracing out the pipes and connections so that they may be platted correctly?

The Expense Is Justified in Almost Every Case

By J. H. Davidson

Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

The proper maintenance and economical operation of water facilities depend upon an accurate knowledge of the pipe lines, connections and controlling valves. A lack of this information may result in serious losses of water or a shortage at a critical time, with delays to traffic. It may also result in inadequate fire protection.

For these reasons the expense involved in tracing and properly platting water service facilities is justified in practically every case. With modern appliances which are available for locating underground pipe lines with a minimum of excavating, the expense in most cases should not be excessive.

Not Justified Unless Changes Are Proposed

By H. M. Goehring

Assistant Engineer Water Service, Great Northern, St. Paul, Minn.

Plats should always show the major units of all existing systems of pipe lines as to correct size of pipe if only approximate location. Knowledge of the exact location of all lines would not necessarily be required for general purposes and any expense would not be justified, in my opinion, unless proposed changes or additions would require such expenses to locate the lines in question. However, any new system of pipe lines or changes therein should be accurately located at the time of installation and later platted correctly on maps. I believe any expenditure required for this purpose is always justified.

Pavement for Turntable Pits

What are the relative merits of vitrified brick or concrete as a pavement for turntable pits?

Concrete Paving Is Preferred

By F. E. Schall

Bridge Engineer, Lehigh Valley, Bethlehem, Pa.

On the Lehigh Valley concrete is used for the paving by reason of its easy adaption to various grades from the rim to the inlets of main drainage; concrete also affords ready adaption to the introduction of special gutters for turntables, where the drainage from the engine house pits is carried through the rim wall to the main drain of the turntable pit. We have had satisfactory results with concrete paving made of a good quality of concrete.

I have had no experience with vitrified brick for paving turntable pits; I can see some difficulty in

shaping the paving to meet all conditions of grades in the pit to provide proper drainage towards the outlet of the main drain and any special gutters; the latter might, however, be made of strips of concrete. When the joints are properly grouted with concrete or asphalt, vitrified brick paving might meet all requirements. In the case of engines accidentally derailing into the pit, any damage to the paving by such accident can no doubt be more readily repaired with brick paving than where concrete paving is used.

Paving Brick Is Preferred

By T. W. Pinard

Assistant Chief Engineer Maintenance of Way, Pennsylvania, Western Region, Chicago

Where a good foundation is available, concrete paving is satisfactory. However, there are times when repairs to the sewers, steam or air lines are necessary, which repairs are rendered very difficult with concrete paving. Also in case of an accident in which a derailed engine is thrown into the pit, repairs to a concrete paving would be difficult and expensive. In general, I prefer a vitrified brick paving for the above reasons.

When Are Septic Tanks Necessary?

Under what conditions should septic tanks be provided in connection with passenger stations?

Septic Tanks Should Be Used Wherever Sewers Are Not Available

By C. W. Wright

Master Carpenter, Long Island, Jamaica, N. Y.

I believe that septic tanks should be used in connection with passenger stations in all cases where sewers are not available. Long Island offers exceptional advantages generally for the use of leaching cesspools, and these have been used successfully in a great many places, both on the railroad and in small public buildings and residences, but the large amount of water used, especially where living rooms are maintained in stations, as is the case on the Long Island railroad, causes this type of cesspool to be an expensive luxury. Although a large number have long been in use, all carry heavy charges for cleaning.

We began the use of septic tanks about six years ago to provide cheaper and more effective sewage disposal than the old leaching cesspools, which these early installations replaced. In most of the early installations the old cesspools were cleaned and used to carry away the flow from the new septic tank, which they did in an entirely satisfactory manner. At some very good stations sanitary toilets and washing facilities had never been installed, although our patrons frequently requested them, for the reason that proper disposal was questionable, some of these stations being but three or four feet above sea level, with the ground saturated for the greater part of the year to within two or three feet of the top. With the septic tank and the tile field system this objection was overcome and proper facilities installed, giving us again a rating as a "good neighbor." Of the seven or eight septic tank installations in use for a period of from five to six years, only one has failed to give perfect satisfaction, and the defect here was found to be that of installation and not of the system itself. One thing must be remembered—that where kitchen and laundry waste is to be disposed of in a septic tank, it is absolutely necessary to have proper grease traps, and these traps properly cleaned at frequent intervals, otherwise the septic tank will receive unjust criticism.

Another thing that has contributed to the comfort of the public at our stations, and in most cases has gone hand in hand with the sanitary facilities, is the hot water system of some approved type. The installation of water, toilets, wash basins, etc., without adequate heating provisions is not to be thought of, and it is our general policy to provide both at the same time.

Septic Tanks Provide Cheap and Satisfactory Disposal Where Sewers Are Lacking

By Engineer of Buildings

Septic tanks are used to advantage in all passenger stations where sewer facilities are lacking and where the amount of business requires a departure from primitive facilities, since the cost of installation and operation are usually small compared with other means of disposal under the same conditions. Septic tanks may be designed for the requirements of any particular case and when once installed require little attention. Aside from their advantages from the standpoint of cost, they create a favorable impression on the traveling public by providing comfortable and sanitary toilet facilities, and also on surrounding property owners who might be annoyed by the disagreeable effluent when other methods are used.

What Makes a Good Foreman*

By C. S. Dodson

Roadmaster, St. Louis Southwestern of Texas, Mt. Pleasant, Texas

In answering the question "What makes a good foreman?" I would say a good foreman must first be a good man, since only a good man can understand and appreciate other men; then, being such a man, he must be thoroughly acquainted with his work in all its details and to the full measure of his responsibility. Experience is indispensable; so is interest; so is pride in his work and for his men. Knowing his work and his men, the foreman is prepared to get the best results from them. He does not have to drive them. He is their companion and he tactfully inspires in them an interest in their work. He speaks of "*our* department, *our* work, *our* success" and when mistakes occur they also are "*our* mistakes."

A good foreman discovers and gives proper recognition to the various degrees of ability among his men and is always mindful to give these special traits or capabilities proper mention when talking to his superior officers. He is also careful to share with them any word of commendation he may receive from his superiors. In short, a good foreman is earnest and honest, both as relates to his work and to his men, and the very manifestation of this spirit, day in and day out, will result in developing a good foreman, one who has a thorough knowledge of his work and how it should be done, and the best means of handling his men to secure these results most readily. The good foreman has an aspiration for both his own and his men's success. This he also shares with his men. He reminds them that there are always places waiting for men who are prepared for promotion.

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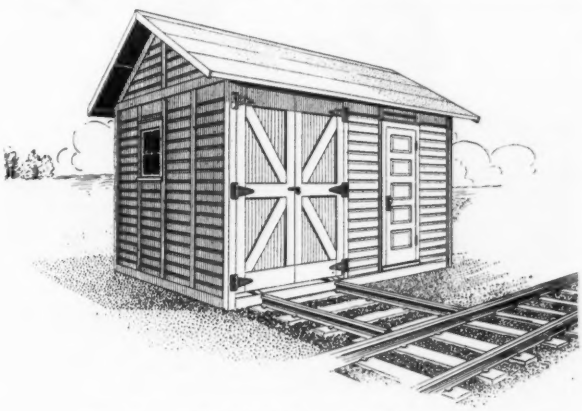
* A paper presented before the fifth annual meeting of the Sanitary Engineering and Maintenance of Way Departments of the St. Louis Southwestern of Texas at Texarkana, Tex., on April 14, 1926.

Getting the Manufacturers' Help

Current Developments in New and Improved Labor Saving Appliances

A New Sectional Tool House

SEARS, ROEBUCK & CO., Chicago, recently entered the supply field with a sectional building, designed to meet the requirements of a section motor car and tool house. This building, as the name implies, is of sectional construction throughout and offers the two principal advantages of a saving in material and a saving in labor. The walls, roof, doors and windows of this building are made up in sections of convenient size and are shipped ready for assembly. The wall sections are three feet wide and are drawn together and fastened by bolts, thereby obviating the necessity of sawing or nailing. All of the sections are interchangeable so that the doors and windows may be placed in any position desired. This makes it possible also to alter the building readily if the necessity should arise. On account of this method of construction, skilled labor is not required to erect the building or to remove it, which can be done by two men in a few hours.



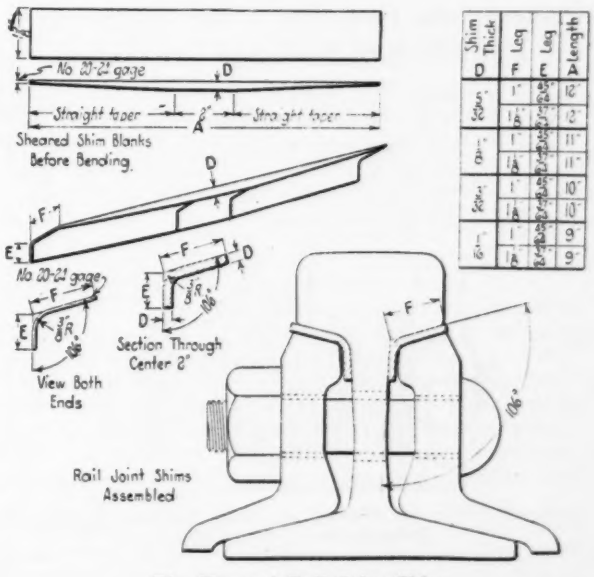
The Sears, Roebuck Sectional Tool House

The wall sections of the house are made of yellow pine or fir drop-siding and are joined together with a tongue and groove interlocking joint which gives a three-inch thickness of material at these points. The doors and sash furnished with the building are equipped with the usual operating hardware. The roof sections are also supplied in widths of three feet and are made of beaded yellow pine or fir ceiling. The roof covering is a 90-lb. slate surfaced roll roofing. No special foundation is required for the building, and any type of flooring can be installed.

This tool house can be furnished in practically any size desired and because of its structural features is suitable for either a permanent or temporary building. When not in service it can be taken down and stored conveniently in a small space. Tool houses of this type have already been installed on a number of railroads.

Steel Shims Restore Worn Joints

IT HAS long been the practice of some track men to take up the wear on the fishing surfaces of rails and angle bars by introducing metal shims between the top of the bars and the underside of the rail heads. The shims used in this way have been made of scrap metal or other material that is readily available on a railroad. This practice has now been placed on a definitely commercial basis by the railroad division of the American Fork & Hoe Company, Cleveland, Ohio, which has developed a line of such shims designed to meet the requirements of all standard rail sections and the varying conditions of wear encoun-



The Tapered Rail Joint Shim

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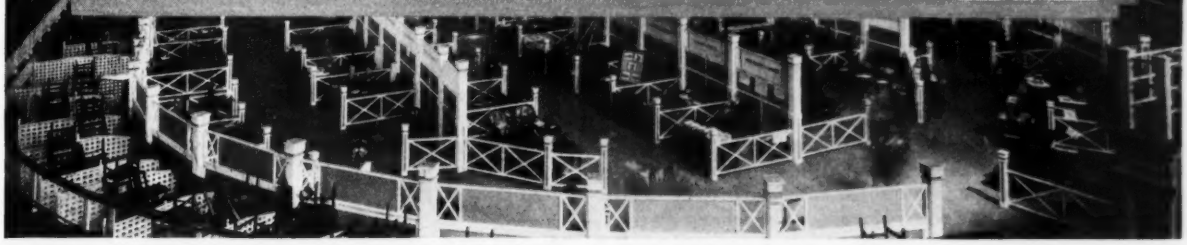

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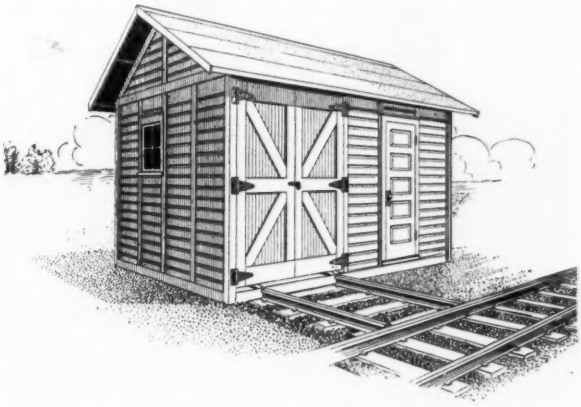

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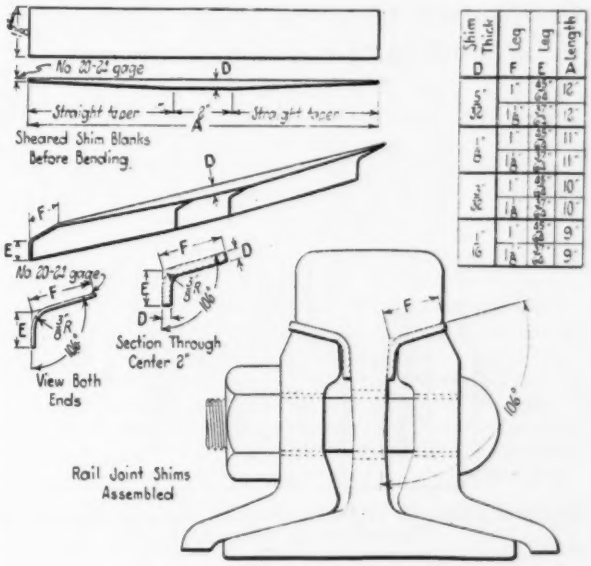


The Tapered Rail Joint Shim

definitely commercial basis by the railroad division of the American Fork & Hoe Company, Cleveland, Ohio, which has developed a line of such shims designed to meet the requirements of all standard rail sections and the varying conditions of wear encoun-

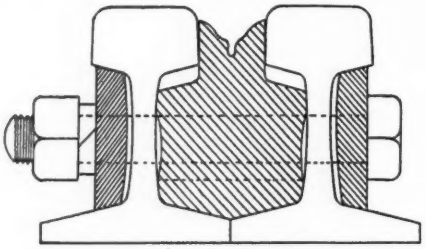
tered in normal conditions of track maintenance. These new shims, however, differ from those commonly used heretofore in that they are tapered toward each end, the greater thickness opposite the joint insuring positive fit where it is most needed and also compensating for the tendency toward greater wear near the mid length of the angle bars.

The shims are made of saw plate steel, a carbon content of 0.70 to 0.90 per cent insuring a hardness that affords good resistance to wear. They are all made of the same width of stock, namely, 1⅝ in., and are bent longitudinally to an angle of 106 deg. to fit over the top of the angle bar. To meet the various conditions of wear the shims are furnished in eight standard sizes, that is, in four thicknesses, namely, 1/16-in., 3/32-in., ⅛-in. and 5/32-in., and two different widths of the top leg of the shim for each thickness. For ordinary rail sections the width of the top of the shim is made one inch, while for rails with wide heads this width is increased to 1⅛ in. The shims have a uniform thickness for a length of two inches at the middle and taper uniformly to an end thickness that ranges from No. 20 to No. 24 sheet metal gage. The length of the shims varies with the thickness and ranges from 9 in. for the thinnest shim to 12 in. for the thickest.

Shims of this type, which are known as the true temper, tapered rail joint shim, are now being applied to worn joints on a number of the railroads. Determination of the most suitable thickness of shim to use in any given case is made in part by the use of a tapered gage, but is influenced also by judgment founded on experience and experimentation. The use of these shims is said to have been effective in restoring to good service joints which had been worn severely under traffic, in some cases to such an extent that the bars were in bearing against the webs of the rails. Although the shims are provided with no mechanical lock against longitudinal movement, experience has shown that they do not slip along the rail.

Continuous Grooved Filler Eliminates Pounding of Railroad Crossings

A NEW form of continuous cast manganese steel filler for use with the ordinary type of railroad crossing which eliminates the shock of the wheels at the rail intersections has been developed by the Wiswell Improved Railroad Crossing Company, Chicago. The fillers are provided with a grooved flangeway



Grooved Filler of Wiswell Crossing Showing Section at Intersection of Main Rails.

which slopes upwardly from the ends of the crossing to the rail intersections so that the tread of the wheel is lifted clear of the rail over the crossing. The groove is of such contour as to protect the flange from being chipped or broken, and the shoulders of the filler are designed to have a clearance of ⅜ in. from the under part of the head of the rail, allowing the filler to be raised by means of a liner at the bottom when the groove has worn down ⅛ in., thus providing for three such adjustments. The fillers are made in two types: one in which the metal filler rests directly on the bases of the rails and the other with a block of treated wood resting on the rail bases and supporting the metal filler with a cushioning effect. The latter is suggested for use where the rails are embedded in concrete. The fillers are made for various combinations of steam road and electric line service.

It is claimed for this construction that it eliminates all pounding at the intersections, with consequent savings in maintenance of both the crossing and equipment and with low cost of installation. One of these crossings has been in service in a busy yard track of the Hocking Valley for some months and is reported to have given satisfactory results in yard service.

A Screw Type Rail Joint Expander

A DEVICE known as the Price rail joint expander has been placed on the market which is designed to effect a marked reduction in the labor necessary to distribute the expansion in rail joints or to open joints for the insertion of fibre end posts in insulated joints. A particular advantage of the device is that it may be

The Rail Joint Expander is Said to be Capable of Developing a Pressure of 40,000 Pounds Without Overstress.

left in place when trains pass over the track on which it is applied.

It consists of two pairs of cast steel blocks or lugs which are bolted to the rails at each side of the joint, one pair of blocks on the outside of the rail and another pair on the inside. Heat treated track bolts are used to hold these blocks securely against the rail. The blocks or lugs attached to the outside of the rail serve as a means for applying the expanding device to the joint, while the blocks placed against the inside of the rail are fitted with projecting lugs through which a round bar two-inches in diameter is passed for the purpose of holding the rails in line during the operation of expanding or closing up the joints.

The rails are separated or drawn together by means of a two-inch screw, which exerts its force against a pair of expanded jaws, which form a U-shaped frame. Each of these jaws is forked at the end to engage the lugs attached to the outside of the rail, being attached to these lugs by means of a bolt. Just behind these forked ends the two lugs are provided with pockets to receive trunnions which are threaded to fit

the two-inch screw, the screw having right-hand threads at one end and left-hand threads at the other. Two holes are provided in the center of the screw in which a lining bar may be inserted for turning.

The holes in the rail lugs are slotted to permit the insertion of track bolts for any ordinary drilling of joint bars. As seen in the illustration the entire device lies below the level of the head of the rail when in place so that it does not foul the track in any way. The expander complete weighs 180 lbs., but is readily separated into two equal parts to facilitate carrying it from one joint to another. It is manufactured by W. F. Price & Sons, Topeka, Kan.

A New Direct-Connected Portable Air Compressor

A NEW type of portable, direct-connected air compressor, designated by the manufacturer as the "Thor Six," has been developed and placed on the market by the Independent Pneumatic Tool Company, Chicago. The unit consists of a four-cylinder, four-cycle gasoline engine and twin compressor cylinders, mounted on a common crank case and connected to a single, four-bearing crank shaft, thus avoiding trouble arising from clutches, couplings or gears for transmitting power from the engine to the compressor. It is claimed for this compressor that its design makes it a light, compact, and simple unit.

The engine is of the valve-in-head type, designed for high efficiency and high torque at low speeds. The four cylinders are vertical and are cast en bloc from

The "Thor Six" Portable Air Compressor

a special grade of grey iron. All important parts are accessible without tearing down the engine. The entire cylinder head may be removed, permitting inspection of the valves, the combustion chambers and the tops of the pistons, and easily removable covers permit inspection of the rocker arms and valve action. Since the valve clearances are located on top, valve tappet adjustments may be made while the engine is running and the valves are warm. Hand hole plates are provided in the upper part of the crank case and in the lower oil pan. The engine is rated at 32 hp. and has a maximum speed of 800 r. p. m. The crank shaft is drop forged from open hearth forging steel. Lubrication is effected by a combination of the splash and force feed systems, so designed that it is not necessary that the unit be perfectly level to obtain adequate lubrication.

The air cylinders are 5¼ in. bore by 6 in. stroke, cast en bloc, from grey iron of sufficient strength and thickness to withstand the desired pressure after reboring. Both the suction and discharge valves are contained in the air cylinder heads, which are separate and removable. The air cylinders are equipped with the Rix supercharger, a simple device which adds to the delivery volume of air by the compression of air in the supercharger during what is normally the idle stroke of the piston. The inlet and discharge valves, as well as the supercharger valves are of the Thor plate type, of light weight and with a low lift. The air receiver is mounted horizontally at the rear of the unit and is fully equipped with a pressure gage, pop safety valve, drain valve and two outlet valves.

The compressor is provided with a simple and positive suction valve unloader which automatically causes the machine to operate without load when the pressure in the receiver reaches a predetermined maximum. A throttle control, operating in conjunction with the unloader, slows the engine down to its minimum speed when running without load. By tripping a lever on the pilot valve of the unloader the compressor can be started without load. The compressor has a displacement of 116 cu. ft. of free air per minute.

The unit has a substantial steel frame and a wide variety of wheeled mountings are available, or a skid mounting may be furnished if desired. A housing, consisting of a steel top and sectional steel sides which may be locked in place, is furnished with each unit. The skid mounted unit is 7 ft. 6 in. long, 2 ft. 4 in. wide, 4 ft. 6 in. high, and weighs 2,500 lb.

Venturafin Unit Heaters

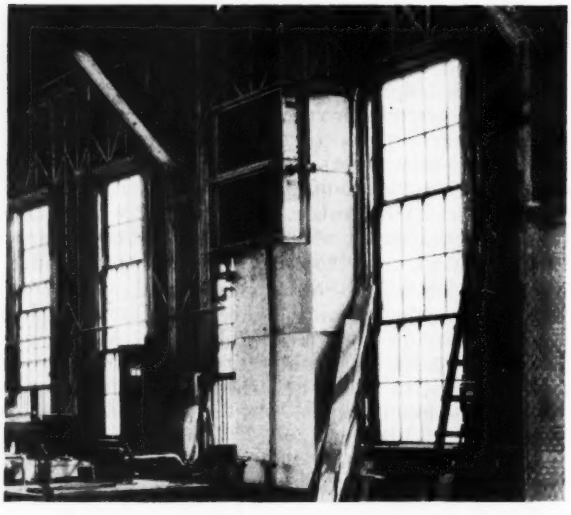
DURING the past year improvements were made in the Venturafin unit heaters and the re-circulating boxes placed on the market by the American Blower Company, Detroit, Mich., and a number of these heaters are now used in railroad and car manufacturing shops. Each unit consists of a re-circulating box, on top of which rests a heating unit composed of an American blower fan so arranged as to blow air through a series of brass and copper coils filled with steam. Cool air is taken in from near the floor and discharged, thoroughly heated, at a height of about 7 ft. above the floor, thus assuring complete and constant circulation of all the air in the room. The steam coils are made from copper and brass which have a relatively high heat conductivity, thus tending to promote an efficiency which, coupled with the method of construction, enables a Venturafin unit to transmit five times the heat given off by an equal length of an ordinary steam coil of the same diameter.

Venturafin tubes are made of straight seamless copper tubing about which a brass ribbon is helically wound in such a way that it forms a continuous "fin." This "fin" is so bent that a large surface is in contact with the outer surface of the tube and this union is later treated so that the fin and tube become practically integral. By this construction the heat-transmitting surface is made nearly five times greater than that of the tube alone.

The method of assembly is simple and strong. The tubes are arranged in rows, usually three deep and staggered. The ends of the tubes are forced into a thin, flexible copper plate, the holes in which are slightly smaller than the tubes. This gives a flange connection said to be absolutely tight, the flanges being given a solder bath to render the connection doubly secure. The flexibility of the plate takes care of expansion and contraction. Standard Venturafin

heaters are built to withstand a pressure of 50 lbs. liquid or steam and any vacuum. They are built throughout of non-corrosive materials, assuring long service.

The characteristic of the Venturafin fan which is a part of every unit especially adapts it for use on this heater. A large central disc prevents back flow or air through the fan wheel and true propeller-shaped blades give maximum efficiency. The large fans used on all units assure the greatest heating effect from the heating coils. The fans are driven by over-size motors fully enclosed, of the industrial type, which form a



No. 7 Venturafin Unit Heater with Re-Circulating Box in Railroad Millroom

reliable operating unit. Except for an occasional oiling, the Venturafin fan needs no attention.

The light construction of this heater makes it possible to combine two or more units in a single housing, without making it unduly heavy, cumbersome or difficult to install. The single units can be installed for right, left or front discharge; double units for discharge either in opposite directions or at right angles, depending on where they are placed. Three and four unit assemblies may be arranged.

"American" Locomotive Ditcher

THE "AMERICAN" locomotive ditcher, recently developed by the American Hoist & Derrick Co., of St. Paul, Minn., combines the functions of a standard ditcher and a work locomotive, while retaining the auxiliary use value and flexibility of the older type. It is capable of handling the whole ditching train of two dump cars, water and fuel tender and caboose at a speed of 15 miles per hour, thereby dispensing entirely with the work locomotive and its crew. Another advantage is that it makes the movement of this equipment independent of the motive power department.

The "American" locomotive ditcher has an eight-wheel truck and operates over standard gage track. The car body is built of structural steel with a heavy gun iron center casting which acts as a solid base for the lower roller path, bull gear and super-structure, serving the same purpose as a concrete bed does for a stationary engine. The car body is mounted on two four-wheel, arch-bar type swiveling trucks of 140,000 lb. capacity with M. C. B. 6-in. by 11-in. journals and 33-in. chilled iron wheels. The trucks have roller side bearings and each truck is operated by a separate brake cylinder to give 50 per cent braking force. The wheels are steel tired. It has a train line and air hose for connecting to other cars.

Power is delivered by bevel gears and universal joints to the inside axle of each truck and the end axles are driven by side connecting rods at the outside ends of all the axles. Side blocking is provided to prevent excessive sway when the machine is being used for heavy locomotive crane work; also, outriggers to give greater stability in the same service are furnished as standard.

The draft rigging and car couplers are M. C. B. standard with Miner friction draft gear and Type "D" couplers. The air brakes are ample to brake the ditcher and train. The machine has a Westinghouse air compressor ample in size to care for the operation of the train brakes and the air dump cars. It is arranged for both straight air and automatic air brakes.

The machinery deck revolves on 20 conical bronze bushed rollers in an enclosed path. This insures smooth rotation and very little wear. Tipping strains are distributed around the 19-ft. circumference of the interlocking gib-rings instead of being concentrated in a single pin. The revolving deck is in two pieces of cast gun iron and provides a rigid platform for the machinery. All gears are steel. The spur gears above deck have teeth cut from the solid. All crank shaft pinions are case hardened steel.

The traveling engine is a 10-in. by 12-in. double cylinder vertical type with Walschaerts reversing

American Locomotive Ditcher in Service

valve gear, balanced piston valves, and cranks set at 90 deg. It has two speeds—15 miles an hour on level track handling its work train of two air dump cars and combination tank car and caboose, and a low speed of 6 miles an hour for making short moves and for use on excessive grades and when pulling much heavier loads than usual. The gears are shifted with air clutches which are very flexible and easily operated. The traveling frictions are disc type.

Hoisting is accomplished with an 8-in. by 8-in. vertical type double cylinder engine with balanced piston valves and cranks set at 90 deg. This engine is run at a constant speed with a governor and performs the operations of hoisting, pulling back the bucket to take a fresh cut, and raising, lowering and slewing the boom. All motions are performed by means of reversing frictions with one hand lever for each motion.

The shafts for the various motions are mounted on the cast steel side frame. The main hoisting drum has a device for reversing the drum and paying out the line. This is of great value when handling rails or ties, as the tongsman does not have to pull the rope off the drum; all he has to do is carry the hook. This device is called a slack line accelerator.

The crowding engine is a 4-in. by 5-in., throttle reversing type; designed to be rugged and dependable. The boom hoist has a mechanical brake and the boom is raised or lowered by a single lever with one motion for each direction.

The boom is of heavy all-steel construction, as is the shovel arm. The dipper, which is of ⅞-yd. capacity, has a manganese steel nose piece and manganese steel dipper teeth with renewable points. A regular locomotive crane boom up to 50-ft. radius can also be supplied for this machine. With this boom the locomotive ditcher becomes a crane with the same lifting capacity as a regular 20-ton crane. Thus equipped it will handle a 1-yd., 1¼-yd. or 1½-yd. clamshell bucket, the size depending upon the radius at which it will be used.

Digging is done on a two-part line, making for greater speed than on machines using more parts of line. In ordinary use the "American" locomotive ditcher is equipped with a pull-back line for the bucket. The function of this is to pull the bucket back to take a new bite. With it is combined the "American" power trip, which is operated with the same lever that controls the bucket when digging.

The boiler is a vertical fire tube type 72 in. in diameter by 9 ft. high. It is built strictly in accordance with the A. S. M. E. Code and bears the stamp of the National Board of boiler and pressure vessels. It is designed for a working pressure of 165 lb. and steaming capacity great enough to permit the machine to be run long distances and still keep up the pressure. It has a rated horsepower of 96, based on 10 sq. ft. of heating surface for each horsepower. It has 278 tubes 2¼-in. in diameter and 6 ft. long. All plates are of fire box steel, the shell being ⅝-in. thick with quadruple butt strap laps, and the heads 9/16-in. thick. The coal bunker on the machinery deck will hold 4,500 lb. of coal, or more than a day's supply. The "American" locomotive ditcher can be arranged to use oil fuel. When rigged to burn oil, a 400-gal. oil tank can be supplied instead of the coal bunker.

The "American" locomotive ditcher is arranged for clamshell work, pile driving, handling rails and ties and for miscellaneous crane service.

Illustrative of the strength and ruggedness of this machine was a little smashup which occurred on a southern road last summer. A crew of a local freight train forgot their orders and smashed into the ditcher's tender car just after the crew had made a hasty dive into the bushes. Before he jumped, the ditcher engineer had set the straight air, but the impact of the locomotive broke the draft rigging and air line and set the air in the ditching train in emergency. Yet such was the force of the collision that the work train was skidded 200 ft. down the track. The impact knocked the pony truck of the freight locomotive back under the engine and derailed three cars.

After the excitement had subsided the "American" locomotive ditcher set its tank car and one of the 20-yd. dump cars on a spur and then pulled the damaged freight locomotive onto the spur. After which it set the three derailed cars back on the track and cleaned up the wreck. Another locomotive had to be sent out to take the local freight to its destination, but nothing was broken on the ditcher.

With the Associations

Metropolitan Track Supervisors' Club

The Metropolitan Track Supervisors' Club will hold its Fifth Annual Outing at the Hotel Nassau, Long Beach, L. I., June 23. A special train will be provided by the Long Island.

Maintenance of Way Club of Chicago

The last meeting of the Maintenance of Way Club for the fiscal year of 1925-26 was held at the Auditorium hotel, Chicago, on May 19, with an attendance of 73. The speaker of the evening was C. E. Johnston, vice-president and general manager of the Kansas City Southern, who presented an address on "Labor and Its Supervision," an abstract of which appears elsewhere in this issue.

American Railway Engineering Association

The Board of Direction of the A. R. E. A. and the general committee of the Engineering division of the A. R. A. met in Chicago on May 19. At that time announcement was made that the American Railway Association had made an appropriation to finance the purchase of equipment necessary for the continuance of the tests on the bearing values of large rollers such as are used in expansion bearings, which tests have been under way at the University of Illinois for several years. These tests, and also the tests which are being made on bridge pins at Lafayette College, Easton, Pa., are being conducted under the general direction of the Committee on Iron and Steel Structures.

The Wood Preservers' Association

The proceedings of the convention that was held in Cleveland last January are now in the hands of the binder and will be completed ready for distribution by June 1.

The executive committee and members of other committees will meet in conjunction with the committee on Wood Preservation of the A. R. E. A. at the Kenmore hotel, Boston, Mass., on June 23-24. In addition to considering the work of the two organizations, a dinner will be held on the evening of June 23 at which Col. W. B. Greeley, forester U. S. Department of Agriculture, will be the principal speaker.

The executive committee has selected the subjects for consideration during the ensuing year and for report at the next annual convention, among which are the following:

The committee on Preservatives (L. C. Drefahl, Grasselli Chemical Company, chairman) will continue the study of methods of handling and using creosote oils and creosote coal tar solutions.

The committee on Car Lumber (J. T. St. Clair, engineer of car construction, A. T. & S. F., chairman) will (1) obtain statistics as to the quantity of lumber used in car construction; (2)

define the restrictions and limitations as to the uses and advantages of various standard preservatives which may be employed in treating lumber used in car construction; (3) cooperate with a committee of the mechanical division, A. R. A., to determine the immediate possibilities for the use of treated lumber in car construction and methods; (4) prepare specifications for the preservative treatment of car material.

The committee on Trunking and Capping (F. C. Krell, assistant forester, Penna., chairman) will, (1) obtain statistics as to the quantity of lumber used by the railroads for trunking and capping; (2) prepare specifications for the treatment of trunking and capping.

The committee on Plant Operation (E. E. Alexander, supervisor of plants, B. & O., chairman) will report on, (1) the most economical methods of handling material at a treating plant and, (2) on a practical method of separating cross ties at a treating plant into various sizes and groups required for treatment and distribution.

The committee on Tie Service Records (Z. M. Briggs, asst. engr., maintenance, Penna., chairman) will, (1) extend the table of tie renewals per mile, adding the percentage of ties treated in 1925 on each road; (2) report on records of 1925 completed service tests compiled by the Forest Products Laboratory; (3) report on special test tracks; (4) study tables and charts for finding the average life of ties.

The committee on Pole Service Records (Roger F. Hosford, telephone engineer, American Tel. & Tel. Co., chairman) will, (1) develop and establish standards for service records; (2) locate service records now available; (3) endeavor to initiate further service records where desirable.

The committee on Posts (W. J. Smith, tie and timber agent, M. K. & T., chairman) will, (1) present all available data covering the use of treated posts; (2) present comparisons between treated, untreated, concrete and steel posts; (3) endeavor to establish test sections.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 12-14, 1926, Richmond, Va.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, Congress Hotel, Chicago, March 8-10, 1927.

American Wood Preservers' Association.—E. J. Stocking, secretary, 111 West Washington street, Chicago. Next convention, January 26-28, 1927, Nashville, Tenn.

Bridge and Building Supply Men's Association.—B. J. Wilson, Pocket List of Railroad Officials, 605 Fischer Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers.—E. A. Morse, secretary, Potosi Tie & Lumber Company, St. Louis, Mo. Next convention, January 28-29, 1927, Nashville, Tenn.

National Railway Appliances Association.—C. W. Kelly, secretary, Seeberger Building, 845 South Wabash avenue, Chicago. Annual exhibition March 7-10 during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 21-23, 1926, Chicago.

Track Supply Association.—W. C. Kidd, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual Exhibit at convention of Roadmasters' and Maintenance of Way Association.

A Torch for Burning Right-of-Way

By H. A. Smith

I HAVE found that a torch made out of a piece of wrought pipe is of great convenience in setting fire to the grass when burning right-of-way. To make this torch I use a piece of 1-in. pipe 3 ft. 6 in. long, threaded at one end so that it can be closed up with a standard cap, while the other end is given a bend of about 30 deg. The curved end is the firing end and is packed with a wick made by twisting a small piece of cotton waste. This wick should be made of such size that it has to be forced in and fills the end of the pipe with a tight fit.

After the wick is in place the torch is ready for charging, this being done by unscrewing the cap at the other end, filling up the pipe with kerosene and then replacing the cap. If the wick is tight it will hold the kerosene very well and I have found that one-half gallon of kerosene will keep the torch going all day. It has proved very convenient in use.

The Material Market

FEW CHANGES in the prices of iron and steel products used in railway tracks and structures have taken place during the past month. In fact, there has been fluctuations in prices in only a relatively small number of items for several months. However, it could hardly be said that the market is strong. In fact, the prices in some lines have shown more or less weakness, and the quotations for a number of items listed in the table represent the prices for relatively small orders for prompt delivery, with more favorable figures possible for purchases in large volumes where the terms for delivery are favorable for the manufacturer. But inasmuch as this is a condition which has maintained for a number of months, it cannot be taken as an indication of any decrease in prices in the near future.

PRICES PER 100 LBS.

	April		May	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes		$2.90 to $3.00		$2.90 to $3.00
Track bolts		3.90 to 4.00		3.90 to 4.00
Angle bars	$2.75	2.75	$2.75	2.75
Tie plates, steel	$2.25 to 2.35	2.25 to 2.35	$2.25 to 2.35	2.25
Boat spikes	3.25	3.25	3.25	3.25
Plain wire	2.50	2.55	2.50	2.55
Wire nails, keg	2.65	2.70	2.65	2.70
Barb wire, galv.	3.35	3.40	3.35	3.40
C. I. pipe, 6 in. to 12 in., ton		49.20 to 50.20		49.20 to 50.20
Plates	1.90	2.10	1.85 to 1.90	2.10
Shapes	1.90 to 2.00	2.10	1.90	2.10
Bars, soft steel	2.00	2.10	2.00	2.10
Rivets, struct.	2.50 to 2.60	2.75	2.50 to 2.60	2.75
Conc. bars, billet	2.00		2.00	
Conc. bars, rail	1.80 to 1.90	2.00	1.80 to 1.90	2.00
Rail, per gross ton, f. o. b. mills		43.00		43.00

The scrap market is weak and prices are definitely lower than they were a month ago. A number of railroads have placed considerable tonnages on the market, but these are not moving freely.

PER GROSS TON

	April	May
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	16.25 to 16.75	15.50 to 16.00
Rails less than 3 ft. long	17.00 to 17.50	16.50 to 17.00
Frogs and switches cut apart	14.75 to 15.25	13.75 to 14.25
Steel angle bars	15.50 to 16.00	14.50 to 15.00

In spite of the advance in the season there has been no marked increase in the demand for lumber, and prices have not experienced a seasonal strengthening such as would normally occur with the opening of building operations. As seen in the table below, current prices are nearly the same as those quoted last month.

SOUTHERN PINE MILL PRICES

	April	May
Flooring, 1x4, B and B flat	$48.06	$47.39
Boards, 1x8, No. 1	35.47	36.48
Dimension, 2x4, 16, No. 1, common	28.01	26.80
Dimension, 2x10, No. 1, common	29.43	29.32
Timbers, 4x4 to 8x8, No. 1	31.32	29.92
Timbers, 3x12 to 12x12, rough		42.35

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear, flat	$27.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	15.00	16.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	16.50	16.50
Timbers, 6x6 to 8x8, No. 1	21.00	21.00
Timbers, 3x12 to 12x12, rough	16.00	16.00

Changes in the prices of Portland cement have occurred in only a few localities. Thus in the brief list presented below the quotations for New Orleans and Montreal are lower than those previously given. The others are the same as before. These prices are per barrel in carload lots, not including package.

New York	$2.15	Minneapolis	$2.32
Pittsburgh	2.09	Denver	2.85
New Orleans	2.30	Dallas	2.05
Chicago	2.10	San Francisco	2.31
Cincinnati	2.37	Montreal	1.42

Railroad News

Briefly Told

The Kansas City & North Western, which ceased operation in 1919 will be dismantled, the rails locomotives and equipment having been sold to the Hyman-Michaels Company, Chicago.

The Interstate Commerce Commission has authorized the acquisition of control of the Alabama & Vicksburg and the Vicksburg, Shreveport & Pacific by the Yazoo & Mississippi Valley, a subsidiary of the Illinois Central.

The Car Service Division of the American Railway Association estimates that traffic during the fall of the present year will be greater than ever before, due to the winter wheat crop prospects and the anticipated heavy movements of both bituminous and anthracite coal.

The record for the rapid loading of coal is now claimed by the Virginian, which recently loaded 11,875 tons of coal into the steamship Lemuel Barrows at Sewell's Point, Va., in 2 hr. and 45 min., or at the rate of 67 tons a minute, two dumpers and four conveyors being used.

The Pennsylvania Supreme Court has held that it is unnecessary, in proceedings to locate a railroad, to specify the number of tracks to be constructed, so as to bring the deep cuts and fills within the 60-ft. width, provided for by the Pennsylvania statutes, the railroad being entitled to that width in addition to lands for cuts and fills.

On the Seventy-first Anniversary of his birth, April 6, the National Safety Council dedicated a bronze memorial to the memory of R. C. Richards, founder of the safety first movement on the railroads of America, who died on January 3, 1925. The tablet is affixed to the base of one of the columns in the waiting room of the Chicago & Northwestern passenger terminal at Chicago.

The Watson-Parker Railroad Labor Bill which was passed by the Senate on May 11, was signed by the President on May 20. This bill abolishes the Railroad Labor Board and provides for the creation of boards of adjustment, a board of mediation to be appointed by the President, methods of submitting labor disputes to arbitration and, when occasion demands, for the appointment of an emergency board by the President.

The Interstate Commerce Commission has issued certificates permitting the Oregon, California & Eastern, the Oregon Trunk, and the Central Pacific to build new lines in Oregon and northern California, with an aggregate length of 420 miles. Some of the permits are conditional and are granted for certain portions of the projected lines only in the event that rights for joint operation with existing lines cannot be obtained.

The provisions of a bill which was introduced by Senator Mayfield of Texas and passed by the Senate on April 22, eliminated the necessity of obtaining a certificate from the Interstate Commerce Commission for the construction of an extension of an existing road. The bill also provides that the certificate of the Interstate Commerce Commission for the abandonment of any railroad, or any portion thereof located wholly within one state shall operate to relieve the carrier from also procuring such authority for such abandonment from the state, as may be required by its laws.

Appropriation bills recently passed by the legislature of New York and signed by the Governor make available $50,000,000 for the elimination of highway grade crossings within the limits of New York City, and $20,000,000 for the same purpose in other parts of the state. The Public Service Commission has begun hearings in different cities on 48 crossing projects outside of New York City. The grade crossing laws of New York has been modified so that the Transit Commission shall not order the elevation of a railroad running longitudinally in a street without the concurrent approval of the local municipal authorities.

Tests were recently conducted on the Pennsylvania between Ft. Wayne, Ind., and Crestline, Ohio, a distance of 132 miles to determine the practicability of a system of telephone communication between the head and rear ends of long freight trains. A temporary arrangement was used, the telephones at each end being connected with No. 17 copper steel twisted wires stapled loosely over the tops of the cars. The problem of developing radio or wired wireless equipment for communicating between the ends of long trains has been under consideration by the telegraph and telephone section of the A. R. A. and this test, which was conducted primarily to determine the need of further investigation, demonstrated the usefulness of such communication by handling the train so that many delays were eliminated.

Passenger train schedules between Chicago and Los Angeles are to be reduced next autumn by about five hours on all three routes—the Atchison, Topeka & Santa Fe, the Chicago & North Western-Union Pacific, and the Rock Island-Southern Pacific routes. A similar reduction in the schedules of limited trains will be made by the North Western-Union Pacific between Chicago and San Francisco. The trains will leave Chicago in the evening as at present, but will arrive in Los Angeles about 9 o'clock in the morning instead of 2 in the afternoon. Eastbound, the limited trains will leave Los Angeles in the evening instead of at noon. An extra fare of $10 will be charged in each direction on these trains. The new schedules will become effective the last of September.

A pageant selebrating the seventy-fifth anniversary of the breaking of ground of what is now the Missouri Pacific will be presented at St. Louis by more than 600 employees of that company during the week of July 4, according to an announcement by President L. W. Baldwin. The pageant, which has been based on the records of the company and other historical data, will be presented in the stadium of Washington University where seats for 25,000 persons will be provided and no admission fee will be charged. Many interesting features have been prepared including transportation methods of the early days by steamboat, stage coach and pony express, the building of the railroad and operating replicas of the first locomotive and train as well as of a modern locomotive. The music will be furnished by three bands composed of Missouri Pacific employees.

At a meeting attended by representatives of Wisconsin railroads called at the instance of the highway commission of that state, on April 23, the commission submitted a plan for the active prosecution and financing of grade separation in that state. Under this proposal a thorough study would be made of all crossings imposing serious hazards, with a view to eliminating them within 5 to 10 years. The commission proposes a blanket subdivision rule to apply in all cases; 40 per cent to be paid by the railroad and 60 per cent by the state. These percentages would apply to all costs incurred except for improvements in the surface or pavement of the highway. The plan was endorsed but not formally approved by the chairman of the state railroad commission at the close of the meeting. The railroad representatives were asked to attend another meeting to be held in about 30 days in order to continue consideration of the plan.

Personal Mention

General

George C. Stephenson, whose promotion to superintendent of the Port Reading creosoting plant of the Reading Company and the Central Railroad of New Jersey, was reported in the April issue, was born at Oneida, Ill., on June 4, 1898. He graduated from Lombard college in 1920 and entered railway service on July 1 of the same year as a chemist on the Atchison, Topeka & Santa Fe, being transferred to the Santa Fe Tie & Lumber Preserving Company at Somerville, Tex., on August 1, 1923. He left this company on April 15, 1925, to become associated with the Port Reading creosoting plant as chemist, which position he was holding at the time of his recent promotion.

George C. Stephenson

W. A. Clark, chief engineer of the Duluth & Iron Range, with headquarters at Duluth, Minn., has been appointed also assistant to the general manager, with the same headquarters.

Engineering

C. H. Paris has been appointed chief engineer of the Chicago & Illinois Midland, with headquarters at Springfield, Ill.

R. B. McKee has been appointed division engineer of the Muscle Shoals, Birmingham & Pensacola, succeeding A. S. Butterworth.

George H. Wells has been appointed chief engineer of the Georgia, Florida & Alabama, with headquarters at Bainbridge, Ga., succeeding **L. V. Bean,** who has resigned.

W. S. Johns, Jr., supervisor on the Pennsylvania, with headquarters at East Aurora, N. Y., has been promoted to division engineer with headquarters at Uniontown, Pa., succeeding J. H. Cooper, transferred.

J. A. Rogers, who has been acting as assistant superintendent of the Canadian National at Saskatoon during the leave of absence of J. W. Crane, has returned to his position of division engineer, Mr. Crane having resumed his duties.

Frank M. Townsend, formerly with the Southern Pacific of Mexico, has been appointed supervising engineer of the Soyopango-Texistepeque line of the International Railways of Central America, Salvador division, succeeding N. Hampton, resigned.

F. M. Sloane, division engineer on the Chicago, Milwaukee & St. Paul, with headquarters at Spokane, Wish., has been promoted to district engineer with headquarters at Milwaukee, Wis., succeeding **C. U. Smith,** who has resigned to become harbor director of the City of Milwaukee. **W. F. McDonald,** assistant engineer, with headquarters at Milwaukee, has been promoted to division engineer, with headquarters at Spokane, Wash., succeeding Mr. Sloane.

C. D. Prentice, cost engineer on the New York, New Haven & Hartford with headquarters at Danbury, Conn., has been promoted to assistant engineer with headquarters at Waterbury, Conn., succeeding **J. B. Bell,** who has been transferred to New Haven, Conn., to succeed **A. F. Jutten,** resigned.

R. G. Bush, assistant division engineer on the Missouri Pacific with headquarters at Hoisington, Kan., has been promoted to division engineer with headquarters at Kansas City, Mo., succeeding **H. Isreal** who has been transferred to Illmo, Mo., in place of **R. H. Halm. W. F. Murray** has been appointed assistant engineer to succeed Mr. Bush.

G. I. Hayward, assistant district engineer of the Northern Pacific, with headquarters at St. Paul, Minn., has been promoted to district engineer, with headquarters at Spokane, Wash., succeeding **J. D. Koren,** who has been retired under the pension rule. **H. F. Brown,** assistant engineer, with headquarters at Seattle, has been promoted to assistant district engineer at St. Paul in place of Mr. Hayward.

E. R. Tattershall, supervisor of piers and buildings on the Marine district of the New York Central at New York, has been promoted to division engineer, with headquarters at Watertown, N. Y., where he suceeds **A. R. Jones,** who has been transferred to Jersey Shore, Pa., in place of **S. E. Armstrong,** who has been transferred to Weehawken, N. J., to succeed **H. C. Thompson,** notice of whose death appears elsewhere in this issue.

Harry S. Jones, whose appointment as valuation engineer of the Gulf, Mobile & Northern was noted in the May issue, was born December 11, 1864, at Marion, Ohio, and was educated at Ohio State University. He entered railway service in August, 1885, as a rodman on the Illinois Central, and from June, 1886, to January, 1891, he was division engineer on the Chicago, Rock Island & Pacific. From February, 1891, until April, 1893, he was successively city engineer at Marion, Ohio, and deputy county surveyor for Marion County, Ohio, and from April, 1893, until May, 1894, he was general foreman on the construction of the lines from Columbus to Sandusky, Ohio. From June, 1894, to February, 1897, he was in private practice. In April, 1897, Mr. Jones became assistant chief engineer of the Mobile & Ohio, and treasurer and manager of the Montgomery Suburban Street Railway Company, a subsidiary of the Mobile & Ohio, and in May, 1901, he became chief engineer of the Mobile, Jackson & Kansas City (now a part of the Gulf, Mobile & Northern). From November, 1903, to March, 1904, he did special work for the general manager of the same road, and from the latter date until April, 1905, he was in private practice. In April, 1905, Mr. Jones became chief engineer and general superintendent of the Mobile, Jackson & Kansas City, and from May, 1908, to January, 1909, he was assistant engineer of the Missouri Pacific. He was out of railway service for several years, but returned in April, 1911, as division engineer and special engineer on valuation work for the Mobile & Ohio. In March, 1920, he became valuation engineer for the Gulf, Mobile & Northern, and in October of the same year became chief engineer, which position he was holding at the time of his recent appointment.

Harry S. Jones

Track

John Shea, roadmaster on the Duluth & Iron Range with headquarters at Two Harbors, Minn., has been elected to the board of directors.

R. C. Campman and **Elmer T. Anderson** have been appointed assistant supervisors of track on the New York Central, with headquarters at Moira, N. Y., and Cherry Tree, Pa., respectively.

W. W. Patchell, assistant supervisor on the Pennsylvania, with headquarters at Gallitzin, Pa., has been promoted to supervisor with headquarters at West Brownsville, Pa., succeeding **J. L. Gressitt,** who has been transferred to Johnstown, Pa., where he succeeds **W. W. Portser,** whose

transfer to Trafford, Pa., was noted in the May issue. **C. P. Willis,** assistant supervisor with headquarters at Blairsville, Pa., has been promoted to supervisor to succeed Mr. Patchell at Gallitzin, Pa. **C. F. Bishop,** assistant on engineer corps, has been promoted to assistant supervisor, with headquarters at Blairsville, Pa., succeeding Mr. Willis.

W. D. Supplee, assistant supervisor on the Philadelphia Division, has been promoted to supervisor with headquarters at Dunkirk, N. Y., succeeding **F. R. Rex,** who has been transferred to Alliance, Ohio, where he succeeds **G. W. Meyers,** assigned to other duties. **R. H. Crew,** assistant supervisor, has been promoted to supervisor with headquarters at Struthers, Pa., succeeding **C. G. Grove,** who has been transferred to East Aurora, N. Y., where he succeeds **W. S. Johns, Jr.,** whose promotion to division engineer is noted in another column of this issue.

James A. McLeod, general track foreman on the terminal improvements of the Illinois Central at Chicago, has been promoted to supervisor at Markham yard, a newly created position. Mr. McLeod's headquarters will be at Chicago.

William Zittlemeir, section foreman on the Minneapolis & St. Louis at Bartlett, Ill., has been promoted to track supervisor with headquarters at Ft. Dodge, Iowa, succeeding **Frank Svec,** who has been transferred to Oskaloosa, Iowa, where he succeeds **F. D. Warren,** resigned.

W. B. Marshall, track supervisor on the Southern with headquarters at Greensboro, N. C., has been promoted to acting roadmaster at Norfolk, Va., during the illness of Roadmaster **J. W. Jones. W. H. Woodward,** assistant supervisor has been promoted to track supervisor, succeeding **F. F. Scoggin,** who has been transferred to Greensboro to succeed Mr. Marshall. **A. R. Bookout** has been appointed track supervisor with headquarters at Charlotte, N. C., succeeding **C. E. Fulk,** deceased.

M. R. Palmer, whose promotion to roadmaster on the Atchison, Topeka & Santa Fe was noted in the May issue, was born on October 14, 1883, in Anderson County, North Carolina, and entered railroad service on September 1, 1902, as section laborer on the Missouri-Kansas-Texas. He was assistant foreman on the St. Louis-San Francisco from November, 1910, to May, 1911, and on May 13, 1911, entered the service of the Atchison, Topeka & Santa Fe as a section foreman, remaining with that company continuously since that time, as a section foreman, extra gang foreman and yard foreman until his recent promotion.

Bridges and Buildings

J. K. Bonner, supervisor of bridges and buildings on the New York Central, with headquarters at Watertown, N. Y., has been promoted to supervisor of piers and buildings on the Marine district, with headquarters at New York, succeeding **E. R. Tattershall,** whose promotion to division engineer is noted elsewhere in this issue. **E. E. Tanner** has been appointed supervisor of bridges and buildings, with headquarters at Watertown, N. Y., succeeding Mr. Bonner.

Water Service

Guy Martin, water service repair man on the Illinois Central with headquarters at Princeton, Ky., has been promoted to supervisor of water service on the Gulf & Ship Island lines of that road, with headquarters at Hattiesburg, Miss.

Francis M. Case, general water supply foreman on the Iowa division, Chicago & North Western, with headquarters at Boone, Iowa, has been transferred to the Northern Iowa and Sioux City divisions, with headquarters at Sioux City, Iowa.

Obituary

Arthur Crable, assistant to the chief engineer of the Hocking Valley, who died on January 8, 1926, was born on April 20, 1879, at Bay City, Mich. He was graduated from the civil engineering department of Ohio State University in 1901, and from June, 1901, to March, 1903, he served in the engineering department of the Baltimore & Ohio, at Zanesville, Ohio. From the latter date until October, 1903, he was resident engineer for the Great Northern Construction Company at Dayton, Ohio. He then served with the Erie until June, 1907, as assistant engineer at Cleveland, Ohio, and division engineer at Huntington, Ind. He was connected with the engineering department of the city of Columbus, and acted as sewer inspector until February, 1908, at which time he entered the service of the Hocking Valley as assistant engineer. Mr. Crable was successively engineer of grade separation, division engineer, engineer maintenance of way and assistant to the chief engineer, which position he was holding at the time of his death.

D. W. Sharpe, retired supervisor of bridges and buildings on the New York, New Haven & Hartford, died in April at his home in New Haven, Conn., at the age of 83 years, following an operation about a year ago, from the effects of which he had never fully recovered.

C. E. Fulk, track supervisor on the Southern, with headquarters at Charlotte, N. C., died on January 9, after an illness of two months. Mr. Fulk entered the service of the Southern as a track laborer in 1906 and was promoted to foreman in 1908 and to track supervisor in 1916.

M. R. Williams, station inspector on the Atchison, Topeka & Santa Fe, with headquarters at Albuquerque, N. M., died on April 3, after an illness of two months, at the age of 78 years. Mr. Williams had been in the employ of the Santa Fe for 47 years, during which time he was for a period of 28 years general foreman of bridges, buildings and water service, with headquarters at Los Vegas, N. M.

Henry C. Thompson, division engineer on the New York Central, with headquarters at Weehawken, N. J., died on April 13 at Bogota, N. Y. Mr. Thompson was born in 1861 at Troy, N. Y., and entered railway engineering work in Colorado, serving at one time on the Atchison, Topeka & Santa Fe. He later returned to the east and graduated from the Columbia School of Mines in 1886. After his graduation he became associated with the Suburban Elevated and later engaged in general engineering work, following which he was appointed supervisor of bridges on the New York Central, with headquarters at Weehawken, N. J. From this position he was promoted to division engineer, which position he was holding at the time of his death.

A. O. Cunningham, consulting engineer of the Terminal Railroad Association of St. Louis, and formerly chief engineer of the Wabash died in St. Louis on May 11. Mr. Cunningham was born on July 8, 1866, at Rangoon, British Burmah, and entered railway service in 1886 as a rodman and levelman on the Northern Pacific, with which company he remained until 1888, later engaging in land survey in North Dakota. He obtained his engineering education at the University of Minnesota from which he graduated in 1894. Following his graduation he was connected successively with the Gillette-Herzog Manufacturing Company, Minneapolis, Minn., the Schultz Bridge & Iron Company and the Pittsburgh Reduction Company, Pittsburgh, Pa., engaged in designing, estimating and contracting until 1899, when he became a member of the Pennsylvania Engineering Company, Pittsburgh, Pa., which had a general consulting and engineering practice. Following this he was contracting manager of the American Bridge Company, at Cleveland, Ohio, in charge of estimates, designs and bids. He was appointed bridge engineer of the Wabash in 1902 and was promoted to chief engineer on September 1, 1905, remaining in that position until October, 1923, when he was made consulting engineer. He resigned in 1924 to engage in private practice as consulting engineer.

The Southern Railway has ordered 38,600 tons of rails from the Tennessee Coal, Iron & Railroad Company, 4,600 tons from the Bethlehem Steel Company and 2,000 tons from the Illinois Steel Company. The new rail will all be standard 39-ft. length and most of it of 100-lb. section. This is for delivery during the latter part of 1926 and is additional to this road's previous order for 46,200 tons ordered for delivery during the first half of 1926, making a total of 91,400 tons for the year, or sufficient to approximately relay 650 miles of track.

Construction News

The Atchison, Topeka & Santa Fe has awarded a contract to Sprague & Nisely, Beatrice, Neb., for the construction of 30 miles of line extending from a connection with the Panhandle & Santa Fe near Panhandle, Texas, to the oil fields in Hutchinson county, Texas. A contract for the construction of stations, section houses, bunk houses, stockyards and wells on this line has been awarded to Joseph E. Nelson & Sons, Chicago. A contract has been awarded to Jerome A. Moss, Chicago, for the construction of a warehouse at Corwith yard, Chicago. The building will have dimensions of 252 ft. by 324 ft. and will cost approximately $110,000. A passenger and freight station of Spanish type architecture will be constructed at Claremont, Cal., at an estimated cost of $35,000. It is reported that plans have been prepared for the construction of a passenger station at Abilene, Kan.

The Canadian Pacific has awarded a contract to McDougall & Sons, Vancouver, B. C., for the construction of an express building at Calgary, Alta., to cost $35,000.

The Central of Georgia has awarded a contract to the Claussen-Lawrence Construction Company, Augusta, Ga., for the construction of a hospital building at Savannah, Ga., to cost $300,000.

The Central of New Jersey has awarded a contract to the McClintic-Marshall Company for structural steel work on bridge No. 11/92 at Chilton street, Elizabeth, N. J., to cost approximately $25,046.

The Chicago, Milwaukee & St. Paul has asked for bids for the construction of a station at Watertown Junction, Wis.

The Chicago & Northwestern has been authorized by the Interstate Commerce Commission to extend its line 5.5 miles southwardly from Benld, Ill., to a connection with the Litchfield & Madison which has been authorized to construct a one-mile extension of its line to the point of connection.

The Chicago, St. Paul, Minneapolis & Omaha is asking for bids for the construction of a water-treating plant at Alton, Ia.

The Chicago, Rock Island & Pacific has been authorized by the Interstate Commerce Commission to construct a line from Liberal, Kan., to Amarillo, Tex., 145 miles, in accordance with the recommendations recently made in a report by an examiner. The application was opposed by the Atchison, Topeka & Santa Fe and the Beaver, Meade & Englewood. The cost is estimated at $7,342,596. The certificate provides that construction shall be commenced on or before October 1, and be completed on or before December 31, 1928. Bids have been asked for the construction of a 20-stall roundhouse at Burr Oak, Ill. A contract for grading and construction of second track from McFarland, Kan., to a point near Volland, a distance of approximately 22 miles, has been awarded to the Flick Construction Company. This project will complete the double tracking of the line between Topeka, Kan., and Herington.

The Choctaw, Oklahoma & Gulf and the Chicago, Rock Island & Pacific, its lessee, has been authorized by the Interstate Commerce Commission to abandon that portion of their line from Watonga, Okla., to Homestead, 21.93 miles, which has also issued a certificate authorizing the Chicago, Rock Island & Pacific to construct a line from a point at or near O'Keene to a point near Homestead, 3.73 miles. The new construction will permit connection with a line of the Rock Island and the substitution of the latter in place of the abandoned line which lacks a favorable grade line.

The Detroit, Toledo & Ironton has awarded a contract to the Ferguson & Edmonton Co., Pittsburgh, Pa., for the grading, fencing, and construction of reinforced concrete box and pipe culverts on the second section of the Durban-Malinta cut-off, extending 16½ miles from the Toledo-Detroit branch of the Ohio state line.

The Florida East Coast has awarded to the Pittsburgh-Des Moines Steel Company contracts for water station improvements at Holly Hill, Fla., and Rio, to cost approximately $35,000 and $30,000 respectively.

The Illinois Central has awarded contract to Joseph E. Nelson & Sons, Chicago, for the construction of a heavy inspection shop building for electric locomotives at Burnside, Chicago. The shop building will have dimensions of 166 ft. by 340 ft., and will cost approximately $300,000. A contract has also been awarded to Joseph E. Nelson & Sons for the construction of a temporary suburban passenger station at Randolph street, Chicago, at an estimated cost of approximately $75,000. Bids are being received for the construction of water-treating plants at Xenia, Ill.; Edgewood and Bluford, Ky.

The Louisville & Nashville will construct with company forces a bridge at Maunie, Ill., at a cost estimated at $200,000. The contract for the fabrication of the steel spans for the bridge has been awarded to the American Bridge Company.

The New York Central has awarded contracts as follows: To the Railroad Supply Company, New York, for structural steel for a viaduct from St. Clair place to West 137th street, New York, estimated cost, $260,000; to H. Du Bois Sons Company, New York, for dredging in the Hudson and Harlem Rivers, $35,000; to the Edw. Joy Company, Syracuse, N. Y., for additions and alterations to piping and wiring in the power station at Avis, Pa., $25,000; to William M. Ballard, Inc., Syracuse, for reconstruction and alterations to boiler house at Avis, $50,000; to the Page Steel & Wire Company, New York, for fencing between Sedgwick avenue and Getty square stations, Yonkers, N. Y., $40,000; to the Jobson Gifford Company, New York, for the reconstruction of a bridge at Woodland, Pa., and strengthening a bridge at Lockport, N. Y., the former to cost approximately, $80,000 and the latter approximately, $45,000.

The New York, New Haven & Hartford will construct with company forces a 10-stall extension to its enginehouse at Cedar Hill, New Haven, Conn., to cost approximately $97,000. The company has also authorized the construction of a new finishing shop, an extension to the locomotive building, etc., at Readville, Mass., to cost approximately $175,000.

The Northern Pacific has purchased four acres of land in West Seattle, Wash., on which it will construct additional team tracks and a switching yard.

The Pennsylvania has awarded a contract to the Pennsylvania Paving Company, Chester, Pa., for raising a bridge at Lloyd street, Lamokin, Pa. The company has awarded a contract to J. F. Brogan & Co., Philadelphia, for the removal of piers of the old bridge over the Susquehanna river at Linden, Pa. A contract has been awarded to the John F. Casey Company, Pittsburgh, Pa., for the construction of a new freight warehouse in that city at an approximate cost of $60,000. The company has awarded a contract to the Turner Construction Company, New York, for the completion of the American Railway Express building at Long Island City, N. Y.; estimated cost, $550,000.

The Province of Alberta has awarded a contract to H. G. MacDonald, Edmonton, Alta., for the grading of a 25-mile Pembina Valley branch line, extending from a point on the Edmonton, Dunvegan & British Columbia between West Lick and Busey, westward in the general direction of Fort Assiniboine.

The Richmond, Fredericksburg & Potomac has authorized the extension of the Potomac transfer facilities, including additional trackage facilities and an island platform at Potomac Yard, Va., at an estimated cost of $48,000. The work will be done by company forces.

The St. Louis-San Francisco will spend approximately $2,500,000 in improving the line of the Muscle Shoals, Birmingham & Pensacola, which it recently acquired. Line changes involving six miles of new construction will be made at Boggy Creek, Ala., and Turpentine to reduce grades, contract for which has been awarded to Reed & Lowe, Birmingham, Ala. A number of trestles will be replaced by concrete culverts, and embankments and cuts will be widened to conform to St. Louis-San Francisco standards. The application of this company to the Interstate Commerce Commission for authority to build a line from Aberdeen, Miss., to

Kimbrough, Ala., 152 miles, to connect its present line with the line of the Muscle Shoals, Birmingham & Pensacola was noted in the May issue.

The South Georgia's plan for authority to construct a line from Hampton Springs, Fla., to Deadman's Bay, a distance of 35 miles, has been denied with prejudice by the Interstate Commerce Commission.

The Southern Pacific, it is reported, will construct a freight terminal and office building at Dallas, Tex., at cost of about $1,000,000. Plans are also reported being prepared for the construction of additions to the terminal facilities at Sanderson, including an addition to the roundhouse, the entire project to cost $150,000.

An appropriation of $450,000 has been made for the construction of a roundhouse, car repair shed, office building and track facilities at Eugene, Ore.

The Union Pacific has been authorized by the Interstate Commerce Commission to construct two branch lines in Scotts Bluff county, Neb., one from a point near Lyman in a southerly direction about 6 miles, with a branch extending southeasterly about 2 miles, and another from a point near Gering in a general southerly direction about 10 miles.

The Venice, Englewood & Southern has been authorized by the Interstate Commerce Commission to construct a line from Venice, Fla., to Englewood, a distance of approximately 13 miles. The Seaboard Air Line proposes to acquire control of the company. The estimated cost of the line is placed at $547,426.

The Virginian Company has awarded a contract to the Thomas Company, Inc., for lining a tunnel at Sophia, W. Va., at an estimated cost of $35,000.

The Wabash is receiving bids for the construction of an oil house at Moberly, Mo.

The Western Pacific has awarded a contract to Eaton & Smith, San Francisco, Cal., for the construction of tracks in the industrial district south of Market street in San Francisco, at an estimated cost of $200,000.

Trade Publications

Wrought Pipe.—A new educational motion picture film, entitled "The Arteries of Industry," is described in a 16-page folder which has been issued by the National Tube Company, Frick building, Pittsburgh, Pa. This film illustrates the process of manufacture of National pipe, step by step, from the mining of the ore to the final tests and inspections. Many of the more important steps also are illustrated graphically by animated diagrams.

Automatic Electric Coaling Station.—The Roberts & Schaefer Company, Chicago, has issued a 12-page booklet describing its "Simplex" patent automatic electric locomotive coaling plant. This booklet illustrates the operation of this station in detail by means of drawings and photographs supplemented by brief descriptive information. It is attractively gotten up and shows the essential features of this station clearly.

Pneumatic Tools.—The Independent Pneumatic Tool Company, Chicago, has issued Catalogue No. 15, descriptive of Thor pneumatic tools, including accessories, busters, drills, grinders, hammers, hoists, holders-on, etc. Instructions for the maintenance and ordering of pneumatic tools and their weights and dimensions packed for export are given, also illustrations showing the use of the tools in building cars and locomotives, in building ships, in boiler shops, foundries, machine shops and steel mills, etc.

Increasing the Efficiency of Roadbed Drainage.—The Armco Culvert and Flume Manufacturers' Association, Middleton, Ohio, has issued a small 16-page pamphlet describing its newly developed product, Armco perforated iron pipe. The first page of the pamphlet presents a short discussion of common drainage problems and the requirements of an adequate sub-drain, while the following pages are devoted to a statement of the construction and merits of the new pipe and a somewhat detailed and illustrated discussion of its application to the specific problems presented in the railway field.

Supply Trade News

General

A. O. Norton, Inc., has moved its offices from 920 South Michigan avenue to 310 South Michigan avenue, Chicago.

The McClintic-Marshall Company will build a one-story brick structural fabricating shop at Chicago, to cost $500,000.

The American Fork & Hoe Company, Cleveland, Ohio, will construct a three-story factory, 40 by 100 ft., at Ashtabula, Ohio.

The Walter Bates Steel Company has awarded a contract to the General Construction Company, Gary, Ind., for the construction of the first unit of its Gary plant.

The Sullivan Machinery Company, Chicago, has moved its Knoxville, Tenn., office, of which **E. L. Thomas** is manager, from 614 Market street to 623 Market street. This company has appointed the **Borchert Ingersoll Company,** St. Paul, Minn., its distributors for that state.

Joseph T. Ryerson & Son, Inc., has taken over the reinforcing bar division or the Penn Metal Company of Boston, Mass., and will immediately add to the sizes and tonnage carried. The facilities will also be increased and many features added. General sales offices have been opened at 677 Concord avenue, Cambridge.

Personal

C. C. Fredericks, whose election as president and general manager of the St. Louis Pump & Equipment Company, St. Louis, Mo., was noted in the May issue, was born on August 18, 1882, at Richmond, Va., and was educated at Valparaiso University, later taking special work at the University of Chicago. Mr. Fredericks was engaged in the practice of law from 1905 to 1910, and from 1910 to 1918 was executive engineer for the S. F. Bowser Company, Ft. Wayne, Ind. He was vice-president and general manager of the St. Louis Pump & Equipment Company from 1918 to 1922, becoming vice-president of the N. W. Matthews Corporation, St. Louis, in 1923 in which position he remained until November, 1925, when he returned to the St. Louis Pump & Equipment Company as noted above.

C. C. Fredericks

W. E. Frazier, Jr., has become associated with **S. F. Bowser & Co., Inc.,** Ft. Wayne, Ind., as railroad sales engineer, with headquarters at the New York office, 19 West Forty-fourth street. Mr. Frazier was formerly employed by the Ellcon Company, New York, and prior to that was with the Valentine Company.

A. K. Barnes, assistant sales manager of the **Koppel Industrial Car & Equipment Company,** has been promoted to district manager of the southern territory with headquarters in the Robert Fulton building, Atlanta, Ga.

George Sealy has been made chairman of the Board of directors of the **International Creosoting Company,** Galveston, Tex., succeeding the late John Sealy. **J. D. Latimer,** manager of the tie and timber department has been promoted to vice-president and general manager and **H. A. West,** secretary and treasurer, has been made a vice-president.

Charles B. Officer, assistant to the president of the **Sullivan Machinery Company,** Chicago, on matters relating to en-

gineering, has been promoted to chief engineer in charge of engineering relating to new machinery or to changes in existing designs. Mr. Officer graduated from Yale University in 1915, and has been connected with this company since that time.

A. D. Carriger has been appointed sales manager of the pump and tank division of the **Wayne Tank & Pump Company**, Ft. Wayne, Ind., succeeding F. O. Salee, who has been appointed sales manager of the domestic appliance division, succeeding F. S. Fenton, Jr., resigned.

Frank W. Edmunds, president of Craft, Inc., New York, has been appointed eastern sales manager of the Boss Bolt & Nut Works Division of the Hoopes & Townsend Corporation, Chicago.

L. O. Stratton has been appointed district manager of the **Buda Company** with headquarters in the Railway Exchange Building at St. Louis, Mo. Mr. Stratton was born at Gide Rock, Nebr., and entered railway service in the mechanical department of the Union Pacific in August, 1912, where he was engaged in various capacities until January, 1916, when he was placed in charge of all motor car repairs on the Oregon Short Line, with headquarters at Pocatello, Idaho. He remained in this position until December 1, 1918, when he entered the service of Mudge & Company as district manager with headquarters at San Francisco, Cal., later being transferred to Denver, Colo., where he remained until August 1, 1922, when he entered the service of the Buda Company, with headquarters at Salt Lake, Utah.

L. O. Stratton

Victor Angerer, vice-president of Wm. Wharton, Jr., & Co., Easton, Pa., died of pneumonia at his home in Ridley Park, Pa., on May 5, at the age of 64. He was a native of Austria, and graduated at the age of 17 from the Technical College in Vienna. He came to the United States shortly afterwards and for about four years he was with William Sellers & Co., Philadelphia, in the capacity of draftsman. In 1884, he became associated with William Wharton, Jr., & Co., Ltd., as a mechanical engineer. After serving in various engineering and supervisory capacities he became vice-president and general manager in 1902. For some years he taught in the Franklin Institute, Philadelphia. Upon the consolidation of William Wharton, Jr., & Co., Inc., and the Taylor Iron & Steel Company, in 1912, when the Taylor-Wharton Iron & Steel Company was formed, he was made vice-president of the latter company and of its subsidiaries, William Wharton, Jr., & Co., Inc., Easton, Pa., the Philadelphia Roll & Machine Company and the Tioga Steel & Iron Company, Philadelphia. In 1922, he was made a director, holding this position until his death. He introduced the use of manganese steel in electric railway track work in 1894 and in steam railroad track work in 1899. He was also author of various general designs of manganese steel track structures now in general use.

Louis R. Lemoine, chairman of the board of the United States Cast Iron Pipe & Foundry Co., Philadelphia, Pa., died on April 23 at Villa Nova, Pa., after a brief illness. Mr. Lemoine was born in 1859 at St. Louis, Mo. He became associated with R. D. Wood & Co., Philadelphia, Pa., in 1883 and in 1896 became vice-president of the McNeal Pipe & Foundry Co., remaining in that capacity until the company was absorbed in the United States Cast Iron Pipe & Foundry Co., with which company he was successively resident manager of the Burlington plant, eastern sales manager and director. He later became general manager of the New Jersey Zinc Company, but retained his directorship in the United States Cast Iron Pipe & Foundry Co. He returned to the latter company in 1910 as second vice-president, was made president in 1911 and from 1923 to the time of his death was chairman of the board.

A. E. Pratt, manager of the railway sales division of the National Carbon Company, Inc. and the Prest-O-Lite Company, Inc., has been appointed manager of the railway sales division of the **E. I. DuPont de Memours & Co.**, for Duco and other finishing materials. Mr. Pratt was born at West Scarborough, Me., on December 11, 1887, and was educated at Mount Union College and Western Reserve University. After leaving college he spent two years in the maintenance of way and signal departments of the Erie. In October, 1909, he was appointed supervisor of signals on the Buffalo Creek, with headquarters at Buffalo. In January, 1913, he returned to the Erie as general foreman on signal construction while automatic signals were being installed on four divisions. In November, 1916, he was promoted to signal supervisor on the Erie, resigning on March 1, 1918, to become sales engineer in the railroad department of the National Carbon Company, Inc. Early in 1922 he was promoted to assistant manager and on January 1, 1923, manager of railway sales of that company and the Prest-O-Lite Company, which position he was holding at the time of his appointment as noted above.

A. E. Pratt

George W. Morrow, track supervisor on the New York, New Haven & Hartford, with headquarters at New Haven, Conn., will join the sales staff of the **Ingersoll-Rand Company** on June 1, with headquarters at Chicago, succeeding **E. F. Kultcher** who has been transferred to the locomotive department. Mr. Morrow will look after the sale of compressed air equipment to the railroads of the middle west, specializing on tie tampers, tie tamper compressors and other portable compressors, as well as pneumatic tools and equipment for the maintenance of way and bridge departments. He will also look after sales to street railways.

George W. Morrow

Mr. Morrow has been engaged in railway maintenance for 22 years, beginning his railroad service in 1904 as a timekeeper and assistant foreman in the maintenance of way department of the New Haven. In 1907 he was promoted to section and extra gang foreman in 1910 to general foreman, following which he was promoted to supervisor in 1916. Mr. Morrow has been active in the work of the Roadmasters' and Maintenance of Way Association, of which organization he is now president.

Morris Wuerpel, assistant to the president of the General Railway Signal Company, and at one time superintendent of bridges and buildings on the Terminal Railroad Association of St. Louis, died at his home in Rochester, N. Y., on April 28, after an illness of two months.

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THE RAILWAY MARKET

$822,000,000 has already been authorized, prior to April 1, for capital expenditures by the railways.

This is approximately $60,000,000 more than during the corresponding period last year.

More than one-half of this sum is for roadway and structures.

$90,000,000 has actually been spent for improvements to roadway and structures prior to April 1.

This is nearly $20,000,000 more than during the corresponding period last year.

In addition $184,000,000 was spent for maintenance of roadway facilities.

Expenditures of such volume means business for railway supply companies.

Have you been getting your share?

The railways can best be reached by using

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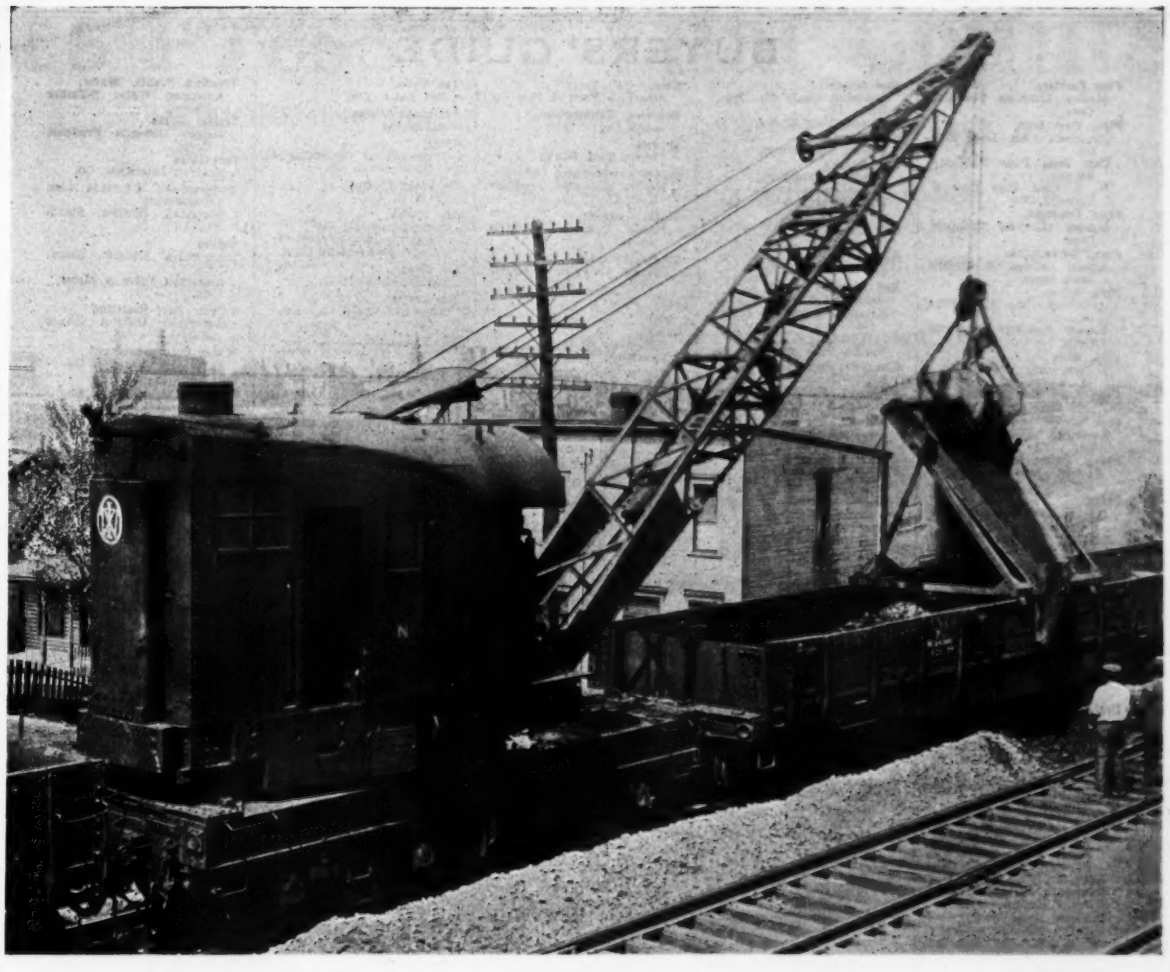


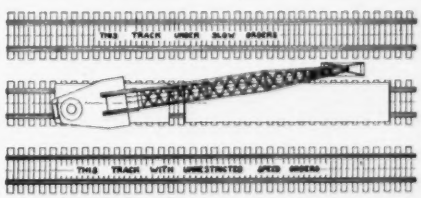
How do YOU clean ballast?

TO aid drainage, coal screenings, cinders and other debris must be removed from the interstices of stone ballast. To have this done by hand is a long, tedious and expensive proposition, while the utilization of an INDUSTRIAL locomotive crane in connection with special screens mounted on gondola or ballast cars meets the dual requirements of large output and low cost.

The INDUSTRIAL WORKS has built and now offers a special 30-ton maintenance of way crane designed especially for ballast-cleaning operation but by no means limited to that alone. It is a most versatile machine, able to perform all that the standard locomotive crane of its capacity can perform in addition to this special ballast cleaning ability.

The rear end of the crane body is tapered off on each side so that the crane can be swung as far as is necessary for this work without interference with the adjoining track. This change is made possible by the use of a 56 inch boiler and oil-burning equipment. This machine has a water storage capacity of 500 gallons. Another feature of the design is a positive stop which prevents the crane from swinging far enough to cause an obstruction. This stop is equipped with a shock absorbing device so that the swinging of the crane is retarded without any injurious effect on the crane structure.

This INDUSTRIAL tapered-end crane is extremely economical. Recently one was engaged in cleaning a land-slide on a section of track owned by an eastern railroad.



Using a 1-yard bucket this machine loaded 23 cars in 6 hours consuming only one and three quarters barrels of oil in the work. The soil was very rocky and quite muddy. Considering the fact of low operating costs and the ability to handle a large quantity of materials this crane has fulfilled the requirements of all railroads for special equipment in the line of maintenance of way outfits. Price, delivery, and any further information on this and other INDUSTRIAL products will gladly be furnished upon request.

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